



## NORDAQ ENERGY, INC.

"KNOWLEDGE AND VISION FOR ALASKA"

March 19, 2012

Mr. Doug Campbell, Chief Branch  
Operations  
U.S. Fish and Wildlife Service  
Division of Realty and Natural Resources  
1011 E. Tudor Road, MS 211  
Anchorage, AK 99503

Mr. Dave Casey, Field Office Manager  
U.S. Army Corps of Engineers  
Kenai Field Office  
805 Frontage Road, Suite 200C  
Kenai, Alaska 99611-7755

Subject: Applications Submitted under Section 1110(b) of the Alaska National  
Interests Lands Act (ANILCA)  
Application for Transportation and Utility Systems and Facilities  
SF299; and  
Application for Department of the Army Permit, 33CFR 325;

Dear Mr. Campbell and Mr. Casey:

NordAq Energy, Inc.(NordAq) together with Cook Inlet Region, Inc. (CIRI), submit the applications referenced above. These applications replace those submitted on September 1, 2011. These applications are submitted in accordance with the regulations implementing the ANILCA guarantee of "adequate and feasible access" to qualified inholders of lands located in conservation system units (CSU). The lands that NordAq and CIRI intend to develop are located in the Kenai National Wildlife Refuge which is defined as a CSU. These applications will allow the construction of facilities to drill, test, delineate, and produce natural gas that is urgently needed in southcentral Alaska .

NordAq and CIRI have conducted several meetings with the U.S Fish and Wildlife Service at the Kenai National Wildlife Refuge in Soldotna and the Regional Headquarters in Anchorage; and with the U.S Army Corps of Engineers Kenai Field Office to present early information and develop the interactive and iterative communication systems that will be needed during review and approval of these applications. New information and discussions since the September 1, 2011 submittal have enabled NordAq to refine the application prior to evaluation through the National Environmental Policy Act (NEPA). Changes from the September 1, 2011 application include: relocation of the access road and drilling pad approximately 6,000 ft to the east, relocation of processing equipment off refuge, and the new operator of Swanson River Oil Field that may allow access, though this remains conditional on reasonable commercial terms.

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Applications Submitted under Section 1110(b) of the ANILCA

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Additionally, we have reviewed the regulatory requirements identified for application in 43 CFR 36.10(c); Handout at A.1, E.1 and sought advice from the agencies on any additional information. We feel this application meets the regulatory requirements and is supplemented with the additional requested information. A table of the required and requested information is provided in the following table for your reference.

<b>REGULATORY</b>	<b>REQUIREMENT</b>	<b>APPLICATION REFERENCE</b>
43 CFR 36.10(c)(1).	Documentation of the property interest held by the applicant.	Exhibit B
43 CFR 36.10(c)(2).	Detailed description of use of the inholding for which the applied ROW permit will serve.	SF299 Application
43 CFR 36.10(c)(3).	If applicable, rationale demonstrating that inholding is effectively surrounded by an area (defined as physical barriers prevent access to public lands).	Not Applicable
43 CFR 36.4(a); 43 CFR 36.10 (d) (incorporating by reference 43 CFR 36.4); Handout at A.1, E.1.	Application must be filed on the same day "with each appropriate Federal agency from which an authorization, such as a permit, license, lease, or certificate is required for the [transportation or utility system].	Applications to U.S. Fish and Wildlife Service as land manager and U.S. Department of Army with regulatory authority over waters of the U.S. received duplicate applications packages as defined below.
	Applicant to determine whether additional information to that required on form is required by federal agencies.	U.S. Fish and Wildlife Service requested that a Plan of Development be submitted with the application and is attached.

NordAq and CIRI have established that there is a strong purpose and need to produce from this newly discovered resource to meet the energy demands of southcentral Alaska. The project also meets the vision of CIRI to provide value to their shareholders through responsible development of the natural resources on the lands conveyed to them through the Alaska Native Claims Settlement Act (ANSCA). We request your attention to these applications and consider the protections for access to these resources in ANILCA and ANSCA.

Should you have any questions please do not hesitate to call Mr. Robert (Bob) Warthen an officer of our company. Any written communication should be copied to our agent that is coordinating our permitting process, Mr. Glenn Ruckhaus with ARCADIS. Contact information is provided below and on the application form SF299

Sincerely,



Robert (Bob) Warthen, President  
NordAq Energy, Inc,  
3000 A Street, Suite 410  
Anchorage, Alaska 99503  
907-646-9315  
907-301-2737 (mobile)

Glenn Ruckhaus  
ARCADIS  
420 L Street, Ste 100  
Anchorage, Ak 99501  
907-277-3774  
907-830-7756 (mobile)

Attached:	Exhibit A	ANILCA Cross Reference Sheet
	Exhibit B	Shadura Unit Agreement
	Exhibit C	SF299 Supporting Information
	Exhibit D	Plan of Development
	Exhibit E	USACE Section 404 Application and Supporting Documents

cc: John Kidd, CEO, NordAq Energy  
Margret Brown, President and CEO, CIRI



**APPLICATION CONTENTS**

SF299 Application and Attachments

Certification of Incorporation  
State of Alaska Certificate of Authority  
NordAq Energy, Inc. Resolutions

- Exhibit A ANILCA Cross Reference Sheet
- Exhibit B Shadura Unit Agreement
- Exhibit C SF299 Supporting Information
- Exhibit D Plan of Development
- Exhibit E USACE Section 404 Application and Supporting Documents



**APPLICATION FOR TRANSPORTATION AND  
 UTILITY SYSTEMS AND FACILITIES  
 ON FEDERAL LANDS**

FORM APPROVED  
 OMB NO. 1004-0189  
 Expires: April 30, 2012

**NOTE:** Before completing and filing the application, the applicant should completely review this package and schedule a preapplication meeting with representatives of the agency responsible for processing the application. Each agency may have specific and unique requirements to be met in preparing and processing the application. Many times, with the help of the agency representative, the application can be completed at the preapplication meeting.

**FOR AGENCY USE ONLY**

Application Number  
 Date filed

1. Name and address of applicant <i>(include zip code)</i>  <b>Robert Warthen</b> <b>NordAq Energy, Inc.</b> <b>3000 A Street, Suite 410</b> <b>Anchorage, AK 99503</b>	2. Name, title, and address of authorized agent if different from Item 1 <i>(include zip code)</i>  <b>Glenn Ruckhaus</b> <b>ARCADIS</b> <b>420 L. Street, Suite 100</b> <b>Anchorage, AK 99501</b>	3. TELEPHONE <i>(area code)</i>  Applicant <b>907.646.9315</b> Authorized Agent <b>907.277.3774</b>
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4. As applicant are you? <i>(check one)</i> a. <input type="checkbox"/> Individual b. <input checked="" type="checkbox"/> Corporation* c. <input type="checkbox"/> Partnership/Association* d. <input type="checkbox"/> State Government/State Agency e. <input type="checkbox"/> Local Government f. <input type="checkbox"/> Federal Agency  * If checked, complete supplemental page	5. Specify what application is for: <i>(check one)</i> a. <input checked="" type="checkbox"/> New authorization b. <input type="checkbox"/> Renewing existing authorization No. c. <input type="checkbox"/> Amend existing authorization No. d. <input type="checkbox"/> Assign existing authorization No. e. <input type="checkbox"/> Existing use for which no authorization has been received* f. <input type="checkbox"/> Other*  *If checked provide details under Item 7
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6. If an individual, or partnership are you a citizen(s) of the United States?  Yes  No

7. Project description *(describe in detail)*: (a) Type of system or facility, *(e.g., canal, pipeline, road)*; (b) related structures and facilities; (c) physical specifications *(length, width, grading, etc.)*; (d) term of years needed; (e) time of year of use or operation; (f) Volume or amount of product to be transported; (g) duration and timing of construction; and (h) temporary work areas needed for construction *(Attach additional sheets, if additional space is needed.)*

**The Shadura Natural Gas Development Project (Project) includes the construction of a drilling pad, processing pad, metering pad, access road, natural gas gathering lines, and fiber optic communication lines. Please see Attachment (Box 7) for a detailed description of the project components. Please also see the Plan of Development (POD) that is attached and provides additional detail on the plans for construction and operations.**

8. Attach a map covering area and show location of project proposal

9. State or local government approval:  Attached  Applied for  Not required

10. Nonreturnable application fee.  Attached  Not required Fee provided 9/1/2011 and reimbursement agreement signed.

11. Does project cross international boundary or affect international waterways?  Yes  No *(If "yes," indicate on map)*

12. Give statement of your technical and financial capability to construct, operate, maintain, and terminate system for which authorization is being requested.

**The Project will be developed by NordAq Energy Inc., a Delaware corporation since 2009. Please see Attachment (Box 12) for a detailed description of the technical and financial capacity of the corporation.**

13a. Describe other reasonable alternative routes and modes considered.

Please see Attachment (Box 13A-B) for a detailed description of the alternatives considered (including alternative routes).

b. Why were these alternatives not selected?

Please see Attachment (Box 13A-B) for a detailed description of why alternatives considered were rejected.

c. Give explanation as to why it is necessary to cross Federal Lands

Drilling and production from a location other than the Kenai National Wildlife Refuge (KNWR) was considered and would not be feasible for the Project. Please see Attachment (Box 13C) for additional information.

14. List authorizations and pending applications filed for similar projects which may provide information to the authorizing agency. (Specify number, date, code, or name)

Please see Attachment (Box 14) for a detailed description of the federal and state permits and authorizations required.

15. Provide statement of need for project, including the economic feasibility and items such as: (a) cost of proposal (construction, operation, and maintenance); (b) estimated cost of next best alternative; and (c) expected public benefits.

Please see Attachment (Box 15) for a detailed description of the costs and benefits of the Project.

16. Describe probable effects on the population in the area, including the social and economic aspects, and the rural lifestyles.

Please see Attachment (Box 16) for a detailed description of these effects.

17. Describe likely environmental effects that the proposed project will have on: (a) air quality; (b) visual impact; (c) surface and ground water quality and quantity; (d) the control or structural change on any stream or other body of water; (e) existing noise levels; and (f) the surface of the land, including vegetation, permafrost, soil, and soil stability.

Please see Attachment (Box 17) for a detailed description of the likely environmental effects.

18. Describe the probable effects that the proposed project will have on (a) populations of fish, plantlife, wildlife, and marine life, including threatened and endangered species; and (b) marine mammals, including hunting, capturing, collecting, or killing these animals.

Please see Attachment (Box 18) for a detailed description of the probably effects on animals. In addition to the answers provided in Boxes 16 to 18, NordAq has provided a supplemental analysis (after its response to Question 18) that evaluates whether the Project is likely to result in significant individual or cumulative impacts on the quality of the human environment, based upon the ten possible "significance" factors under 40 C.F.R. § 1508.27(b). The analysis concludes that the Project is not likely to result in significant impacts, therefore an EIS is not required.

19. State whether any hazardous material, as defined in this paragraph, will be used, produced, transported or stored on or within the right-of-way or any of the right-of-way facilities, or used in the construction, operation, maintenance or termination of the right-of-way or any of its facilities. "Hazardous material" means any substance, pollutant or contaminant that is listed as hazardous under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended, 42 U.S.C. 9601 et seq., and its regulations. The definition of hazardous substances under CERCLA includes any "hazardous waste" as defined in the Resource Conservation and Recovery Act of 1976 (RCRA), as amended, 42 U.S.C. 9601 et seq., and its regulations. The term hazardous materials also includes any nuclear or byproduct material as defined by the Atomic Energy Act of 1954, as amended, 42 U.S.C. 2011 et seq. The term does not include petroleum, including crude oil or any fraction thereof that is not otherwise specifically listed or designated as a hazardous substance under CERCLA Section 101(14), 42 U.S.C. 9601(14), nor does the term include natural gas.

Please see Attachment (Box 19) for a detailed description of hazardous materials.

20. Name all the Department(s)/Agency(ies) where this application is being filed.

U.S. Fish and Wildlife Service, Division of Realty and Natural Resources (Attn. Ms. Susan LaKovski, Realty Specialist)  
U.S. Army Corps of Engineers, Kenai Field Office (Attn: Mr. Dave Casey, Field Office Manager)

I HEREBY CERTIFY, That I am of legal age and authorized to do business in the State and that I have personally examined the information contained in the application and believe that the information submitted is correct to the best of my knowledge.

Signature of Applicant

Date 03/19/2012

Title 18, U.S.C. Section 1001 and Title 43 U.S.C. Section 1212, make it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious, or fraudulent statements or representations as to any matter within its jurisdiction.

(Continued on page 3 )

(SF-299, page 2)

APPLICATION FOR TRANSPORTATION AND UTILITY SYSTEMS  
AND FACILITIES ON FEDERAL LANDS

GENERAL INFORMATION  
ALASKA NATIONAL INTEREST LANDS

This application will be used when applying for a right-of-way, permit, license, lease, or certificate for the use of Federal lands which lie within conservation system units and National Recreation or Conservation Areas as defined in the Alaska National Interest Lands Conservation Act. Conservation system units include the National Park System, National Wildlife Refuge System, National Wild and Scenic Rivers System, National Trails System, National Wilderness Preservation System, and National Forest Monuments.

Transportation and utility systems and facility uses for which the application may be used are:

1. Canals, ditches, flumes, laterals, pipes, pipelines, tunnels, and other systems for the transportation of water.
2. Pipelines and other systems for the transportation of liquids other than water, including oil, natural gas, synthetic liquid and gaseous fuels, and any refined product produced therefrom.
3. Pipelines, slurry and emulsion systems, and conveyor belts for transportation of solid materials.
4. Systems for the transmission and distribution of electric energy.
5. Systems for transmission or reception of radio, television, telephone, telegraph, and other electronic signals, and other means of communications.
6. Improved rights-of-way for snow machines, air cushion vehicles, and all-terrain vehicles.
7. Roads, highways, railroads, tunnels, tramways, airports, landing strips, docks, and other systems of general transportation.

This application must be filed simultaneously with each Federal department or agency requiring authorization to establish and operate your proposal.

In Alaska, the following agencies will help the applicant file an application and identify the other agencies the applicant should contact and possibly file with:

U.S. Department of Agriculture  
FOREST SERVICE (USFS)  
Alaska Regional Office (Region 10)  
*Physical Address:*  
Federal Office Building  
709 West 9th Street  
Juneau, Alaska 99801  
*Mailing Address:*  
P.O. Box 21628  
Juneau, Alaska 99802  
Telephone: 907-586-8806

U.S. Department of the Interior  
BUREAU OF INDIAN AFFAIRS (BIA)  
Alaska Regional Office (Juneau)  
*Mailing/Physical Address:*  
P.O. Box 25520  
709 West 9th Street  
Juneau, Alaska 99802  
Telephone: 800-645-8397

U.S. Department of the Interior  
BUREAU OF LAND MANAGEMENT (BLM)  
Alaska State Office  
*Mailing/Physical Address:*  
222 West 7th Avenue #13  
Anchorage, Alaska 99513  
Telephone: 907-271-5960

U.S. Department of the Interior  
NATIONAL PARK SERVICE (NPS)  
Alaska Regional Office (Anchorage)  
*Mailing/Physical Address:*  
240 West 5th Avenue, Room 114  
Anchorage, Alaska 99501  
Telephone: 907-644-3501

U.S. Department of the Interior  
FISH AND WILDLIFE SERVICE  
Alaska Regional Office (Region 7)  
*Mailing/Physical Address:*  
1011 East Tudor Road  
Anchorage, Alaska 99501  
Telephone: 907-271-5011

Note: Filings with any Department of the Interior agency may be filed with any office noted above or with the:

U.S. Department of the Interior  
OFFICE OF ENVIRONMENTAL POLICY AND COMPLIANCE  
Alaska Regional Office (Anchorage)  
Regional Environmental Officer  
1689 C Street, Room 119  
Anchorage, Alaska 99501  
Telephone: (907) 271-5011

U.S. Department of Transportation  
FEDERAL AVIATION ADMINISTRATION  
Alaska Regional Office (Anchorage)  
222 West 7th Avenue, #14  
Anchorage, Alaska 99513  
Telephone: 907-271-5269

*NOTE* - The Department of Transportation has established the above central filing point for agencies within that Department. Affected agencies are: Federal Aviation Administration (FAA), Coast Guard (USCG), Federal Highway Administration (FHWA), Federal Railroad Administration (FRA).

*OTHER THAN ALASKA NATIONAL INTEREST LANDS*

Use of this form is not limited to National Interest Conservation Lands of Alaska.

Individual departments/agencies may authorize the use of this form by applicants for transportation and utility systems and facilities on other Federal lands outside those areas described above.

For proposals located outside of Alaska, applications will be filed at the local agency office or at a location specified by the responsible Federal agency.

**SPECIFIC INSTRUCTIONS**  
(Items not listed are self-explanatory)

*Item*

- 7 Attach preliminary site and facility construction plans. The responsible agency will provide instructions whenever specific plans are required.
- 8 Generally, the map must show the section(s), township(s), and ranges within which the project is to be located. Show the proposed location of the project on the map as accurately as possible. Some agencies require detailed survey maps. The responsible agency will provide additional instructions.
- 9, 10, and 12 - The responsible agency will provide additional instructions.
- 13 Providing information on alternate routes and modes in as much detail as possible, discussing why certain routes or modes were rejected and why it is necessary to cross Federal lands will assist the agency(ies) in processing your application and reaching a final decision. Include only reasonable alternate routes and modes as related to current technology and economics.
- 14 The responsible agency will provide instructions.
- 15 Generally, a simple statement of the purpose of the proposal will be sufficient. However, major proposals located in critical or sensitive areas may require a full analysis with additional specific information. The responsible agency will provide additional instructions.
- 16 through 19 - Providing this information in as much detail as possible will assist the Federal agency(ies) in processing the application and reaching a decision. When completing these items, you should use a sound judgment in furnishing relevant information. For example, if the project is not near a stream or other body of water, do not address this subject. The responsible agency will provide additional instructions.

Application must be signed by the applicant or applicant's authorized representative.

If additional space is needed to complete any item, please put the information on a separate sheet of paper and identify it as "Continuation of Item".

SUPPLEMENTAL

NOTE: The responsible agency(ies) will provide additional instructions	CHECK APPROPRIATE BLOCK	
I - PRIVATE CORPORATIONS	ATTACHED	FILED*
a. Articles of Incorporation	<input checked="" type="checkbox"/>	<input type="checkbox"/>
b. Corporation Bylaws	<input checked="" type="checkbox"/>	<input type="checkbox"/>
c. A certification from the State showing the corporation is in good standing and is entitled to operate within the State.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
d. Copy of resolution authorizing filing	<input checked="" type="checkbox"/>	<input type="checkbox"/>
e. The name and address of each shareholder owning 3 percent or more of the shares, together with the number and percentage of any class of voting shares of the entity which such shareholder is authorized to vote and the name and address of each affiliate of the entity together with, in the case of an affiliate controlled by the entity, the number of shares and the percentage of any class of voting stock of that affiliate owned, directly or indirectly, by that entity, and in the case of an affiliate which controls that entity, the number of shares and the percentage of any class of voting stock of that entity owned, directly or indirectly, by the affiliate.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
f. If application is for an oil or gas pipeline, describe any related right-of-way or temporary use permit applications, and identify previous applications	<input checked="" type="checkbox"/>	<input type="checkbox"/>
g. If application is for an oil and gas pipeline, identify all Federal lands by agency impacted by proposal.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
II - PUBLIC CORPORATIONS		
a. Copy of law forming corporation	<input type="checkbox"/>	<input type="checkbox"/>
b. Proof of organization	<input type="checkbox"/>	<input type="checkbox"/>
c. Copy of Bylaws	<input type="checkbox"/>	<input type="checkbox"/>
d. Copy of resolution authorizing filing	<input type="checkbox"/>	<input type="checkbox"/>
e. If application is for an oil or gas pipeline, provide information required by Item "I-f" and "I-g" above.	<input type="checkbox"/>	<input type="checkbox"/>
III - PARTNERSHIP OR OTHER UNINCORPORATED ENTITY		
a. Articles of association, if any	<input type="checkbox"/>	<input type="checkbox"/>
b. If one partner is authorized to sign, resolution authorizing action is	<input type="checkbox"/>	<input type="checkbox"/>
c. Name and address of each participant, partner, association, or other	<input type="checkbox"/>	<input type="checkbox"/>
d. If application is for an oil or gas pipeline, provide information required by Item "I-f" and "I-g" above.	<input type="checkbox"/>	<input type="checkbox"/>

\* If the required information is already filed with the agency processing this application and is current, check block entitled "Filed." Provide the file identification information (e.g., number, date, code, name). If not on file or current, attach the requested information.

## NOTICES

NOTE: This applies to the Department of the Interior/Bureau of Land Management (BLM).

The Privacy Act of 1974 provides that you be furnished with the following information in connection with the information provided by this application for an authorization.

AUTHORITY: 16 U.S.C. 310 and 5 U.S.C. 301.

PRINCIPAL PURPOSE: The primary uses of the records are to facilitate the (1) processing of claims or applications; (2) recordation of adjudicative actions; and (3) indexing of documentation in case files supporting administrative actions.

ROUTINE USES: BLM and the Department of the Interior (DOI) may disclose your information on this form: (1) to appropriate Federal agencies when concurrence or supporting information is required prior to granting or acquiring a right or interest in lands or resources; (2) to members or the public who have a need for the information that is maintained by BLM for public record; (3) to the U.S. Department of Justice, court, or other adjudicative body when DOI determines the information is necessary and relevant to litigation; (4) to appropriate Federal, State, local, or foreign agencies responsible for investigating, prosecuting violation, enforcing, or implementing this statute, regulation, or order; and (5) to a congressional office when you request the assistance of the Member of Congress in writing.

EFFECT OF NOT PROVIDING THE INFORMATION: Disclosing this information is necessary to receive or maintain a benefit. Not disclosing it may result in rejecting the application.

The Paperwork Reduction Act of 1995 requires us to inform you that:

The Federal agencies collect this information from applicants requesting right-of-way, permit, license, lease, or certifications for the use of Federal Lands.

Federal agencies use this information to evaluate your proposal.

No Federal agency may request or sponsor and you are not required to respond to a request for information which does not contain a currently valid OMB Control Number.

**BURDEN HOURS STATEMENT:** The public burden for this form is estimated at 25 hours per response including the time for reviewing instructions, gathering and maintaining data, and completing and reviewing the form. Direct comments regarding the burden estimate or any other aspect of this form to: U.S. Department of the Interior, Bureau of Land Management (1004-0189), Bureau Information Collection Clearance Officer (WO-630) 1849 C Street, N.W., Mail Stop 401 LS, Washington, D.C. 20240.

A reproducible copy of this form may be obtained from the Bureau of Land Management, Division of Lands, Realty and Cadastral Survey, 1620 L Street, N.W., Rm. 1000 LS, Washington, D.C. 20036.



Proprietary Information Removed

Proprietary Information Removed

**Exhibit A**  
**ANILCA Cross Reference Sheet**



Exhibit A  
ANILCA Cross Reference Sheet

REGULATORY	REQUIREMENT	APPLICATION REFERENCE
43 CFR § 36.10(c)(1).	Documentation of the property interest held by the applicant.	Exhibit B
43 CFR § 36.10(c)(2).	Detailed description of use of the inholding for which the applied ROW permit will serve.	SF299 Application Boxes 7 and 15
43 CFR § 36.10(c)(3).	If applicable, rationale demonstrating that inholding is effectively surrounded by an area (defined as physical barriers prevent access to public lands).	Not Applicable
43 CFR § 36.4(a); 43 CFR § 36.10 (d) (incorporating by reference 43 CFR § 36.4); USFWS Handout at A.1, E.1.	Application must be filed on the same day "with each appropriate Federal agency from which an authorization, such as a permit, license, lease, or certificate is required for the [transportation or utility system].	Applications to U.S. Fish and Wildlife Service as land manager and U.S. Department of Army with regulatory authority over waters of the U.S. received duplicate application packages.
	Applicant to determine whether additional information to that required on form is required by federal agencies.	U.S. Fish and Wildlife Service requested that a Plan of Development be submitted with the application and is attached as Exhibit D.



Exhibit B  
Shadura Unit Agreement

Removed

Exhibit B  
Shadura Unit Agreement

Removed

**Exhibit C**  
**SF299 Supporting Information**



## BOX 7 – PROJECT DESCRIPTION

### (a) Type of system or facility

The proposed Shadura Natural Gas Development Project (Project) includes the infrastructure that is reasonably necessary to produce and transport known gas reserves from the Applicant's oil and gas lease in the Kenai National Wildlife Refuge (KNWR) to the ConocoPhillips' Alaska Natural Gas (CPANG) Nikiski pipeline which is located outside of the KNWR boundary. Presentation of information in the subsequent sections segregates facilities within KNWR and State land, which constitutes the entire Project. Supplemental information is provided in the Plan of Development (POD) included as Exhibit D with this Right of Way (ROW) application.

### (b) Related structures and facilities

#### a. Related structures and facilities in KNWR

Reasonably necessary infrastructure to be located on Cook Inlet Region Inc. (CIRI) coal, oil, and gas estate leased to NordAq within the KNWR will include the following civil and mechanical structures and facilities:

- One approximately 600-foot by 600-foot gravel drilling and processing pad (8.26 acres) that can support the completion of six natural gas wells and production equipment, one Class II disposal well, one water well, and one communication tower within the KNWR; and
- A 2.69-mile, 80-foot right-of-way that will enable construction of an all season gravel road and installation of natural gas gathering lines, electric cable, and communication cable, and will tie to new and existing ROWs on adjacent State lands.

#### b. Related structures and facilities on State of Alaska Land

NordAq will include the following on State of Alaska Land:

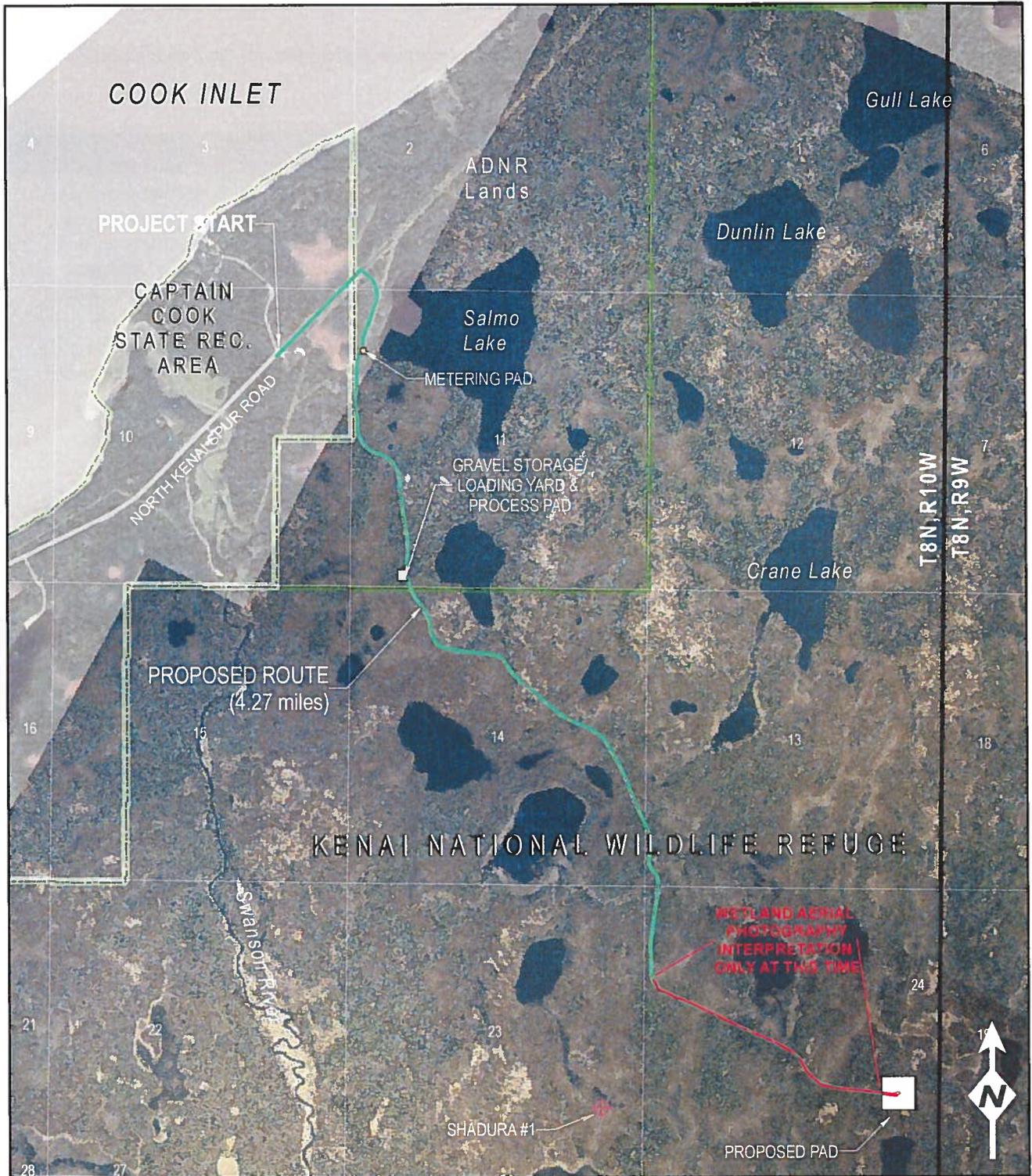
- A 1.8-mile, 80-foot right-of-way that will enable continuation of the all season gravel road, natural gas gathering lines, and communication cable from KNWR to existing infrastructure;
- A 100-foot by 100-foot gravel meter pad with communication tower; and
- A 200-foot by 200-foot gas processing pad.

Figure 1 shows the locations of the pads and the alignment of the service road.

### (c) Physical specifications (*length, width, grading, etc.*)

#### ***Drilling and Processing Pad on KNWR Land***

Construction of the Project's facilities on the KNWR will involve two configurations. First, NordAq will construct a 15-foot-wide gravel testing road to drill and test a delineation well. Upon completion of a successful evaluation, NordAq will complete construction of the full proposed facilities for production and operation, which will involve building out the drilling pad and service road to their full configurations and construction of the meter and processing pad, gathering lines, power cable, fiber optic cable, and installation of production equipment.



Proposed Route	Metering Pad
Proposed Pad	<b>Administrative Boundaries</b>
Shadura #1	Kenai National Wildlife Refuge
Roads	Captain Cook State Recreation Area

**SCALE:**

Projection State Plane, Alaska Zone 4, NAD83



**PROPOSED ROUTE & PAD LOCATION**

SHADURA DEVELOPMENT PROJECT

FIGURE:  
**1**

***SF 299 Application Exhibit C - Supplemental Information for NordAq's Shadura Natural Gas Development Project  
March 19, 2012***

The proposed gravel drilling pad will have a surface dimension of 600 ft by 600 ft, approximately three feet of fill with a 1.5:1 side slope for a total footprint of footprint of 8.26 acres. (Figure 2). The following facilities will be constructed on the drilling pad:

- One Class II disposal well;
- Six natural gas development wells;
- One prefabricated 500-gallon aboveground storage tank (AST) for storing methanol at each well (six total), with each tank including an in-line chemical pump for injecting the methanol into the associated flowline;
- One well house allocated for each well (eight total) with a heat exchanger and line heater;
- One water well;
- Indirect line heater for each well to facilitate good separation and prevent formation of hydrates;
- One pipe rack area used to consolidate the gathering lines and direct flow;
- One control room and microwave relay tower;
- Pig launcher and receiver facility.

Figure 2 shows the conceptual layout of wells and equipment on the drilling and processing pad. Compression will not be needed at project start up, but may be necessary in the future. The final design of the pad and associated infrastructure will take into consideration feasibility, safety and minimal disturbance of the surface lands managed by the U.S. Fish and Wildlife Service (USFWS).

***Processing Pad on State of Alaska Land***

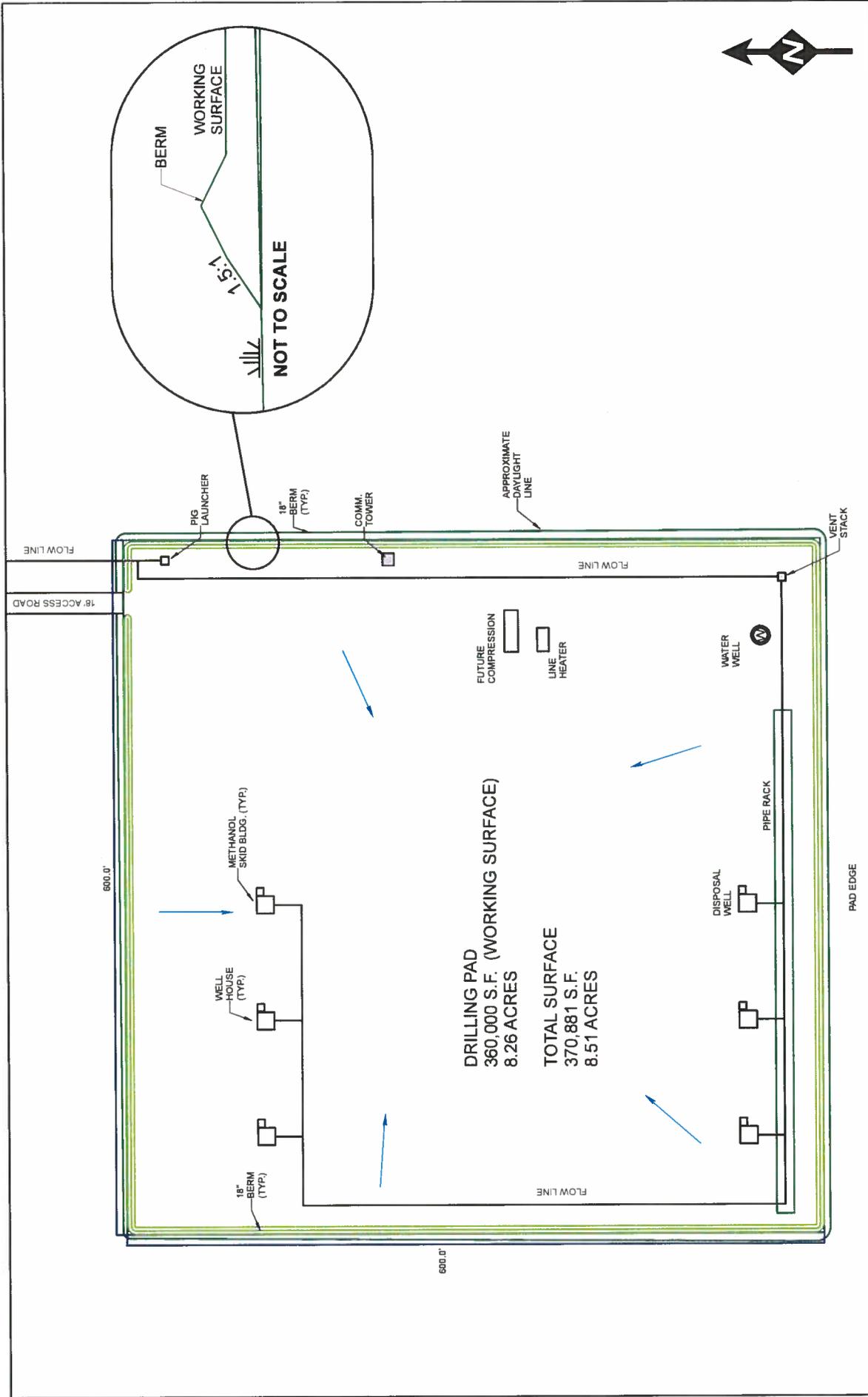
A 200-foot by 200-foot processing pad will be constructed on approximately 3 feet of fill with a total footprint of 0.92 acres. The processing pad will be located on State of Alaska land immediately north of the boundary with KNWR. The following facilities will be placed on the Processing Pad:

- Two generators, a primary gas-fired generator and a backup diesel generator;
- One dehydration unit comprised of glycol contactor/cooler/reboiler, heat exchanger, filter, and inline heater;
- 500-gallon diesel fuel storage;
- One 500 barrel produced water holding tank; and
- Storage connex.

***Meter Pad on State of Alaska Land***

The 100-foot by 100-foot gravel meter pad will be constructed by placing approximately three feet of fill in a rectangular footprint of 0.3 acres. The following facilities will be placed on the meter pad:

- One control room and microwave relay tower;
- One pig launcher and receiver area at the end of the gathering line;
- One blow down area for the gathering lines (before the meter station);
- One meter station (after the pig receiver); and
- One tie-in to the CPANG transport pipeline.



<p><b>Surface Water Flow Direction</b></p>	<p>ALASKA Project Location</p>	<p><b>SCALE:</b></p>	<p>AK DEP AND VRI FOR ALASKA</p>	<p><b>DRILLING PAD LAYOUT</b></p>	<p><b>FIGURE: 2</b></p>
<p><b>SHADURA DEVELOPMENT PROJECT</b></p>					

All facility equipment will be prefabricated off site as much as possible and transported to the production pad by truck. Construction of facilities to support production will begin after the processing and meter pads are constructed. Figure 3 shows the conceptual layout of equipment on the processing pad and meter pad.

### **Service Road**

Initially, NordAq will construct a testing road to access the drilling pad for drilling and testing. This gravel road will have a 15-foot-wide surface. Figure 4 shows typical sections of the testing road for upland and wetland locations.

After completion of its evaluation, NordAq will enlarge the testing road into an 18-foot-wide single-lane service road that will connect the drilling pad in the KNWR to the production and meter pad outside of the Refuge. The road will be constructed of 24 to 30 inches of gravel, depending on locations (Figure 5). The width of the construction zone for the road will range from about 40 to 50 feet (Figure 6), all within the proposed 80-foot ROW. Within the proposed ROW, the service road will be approximately 18 feet wide at the crown with 1.5:1 side slopes (Figure 5). Depending on topography, these parameters will result in a road footprint ranging from 21 to 27 feet in width. The width of the area cleared within the ROW will vary based on topography.

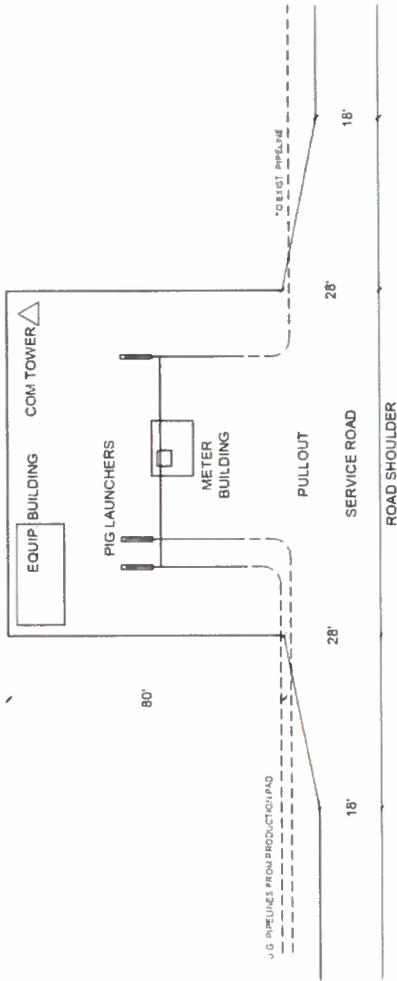
During construction of the service road, NordAq also will build temporary turnarounds spaced on quarter-mile intervals to reduce the distance that dump trucks will need to back up. These turnarounds will be 30-foot wide by 42-foot long (Figure 7) and will only be constructed in naturally cleared areas. Temporary turnouts will be constructed on geofabric to protect the underlying vegetative mat. Gravel for turnouts will be removed upon completion of construction using a combination of excavator and vacuum truck.

The 4.27-mile-long service road will include a maximum of 15 pullouts between the end of the North Kenai Spur Highway and the drilling and processing pad, with approximately ten located on the KNWR. Preliminary plans call for pullouts to be spaced at ¼-mile intervals for safety purposes. During construction, pullouts will be located and spaced based on a line-of-sight basis. The safety pullouts will be 10 feet wide and 100 feet long with 50-foot transitions. This will result in a surface width of 28 feet in the vicinity of the pullouts. This width will allow conventional tractor trailer units to pull off and on the road without having to back up, which will make operations much safer. Figure 7 shows a typical service road pullout.

The proposed service road will cross a variety of land ownerships. From the end of the North Kenai Spur Highway, it will follow an existing Kenai Peninsula Borough (KPB) ROW north for about 0.3 miles along a 30-foot wide, unimproved trail. The road will then bear east for about 0.1 miles on Alaska Department of Natural Resources (ADNR) State land before intersecting the Nikiski Pipeline ROW, which it will then parallel southeast for about 0.3 mile. A short spur road for a meter pad will veer east at this point 0.2 mile then travel south for 1.2 miles on ADNR State lands before proceeding south-southeast across 2.69 miles of the KNWR to the drilling and processing pad.

The service road will cross three streams (Figure 1): two anadromous and one non-anadromous. At its closest location, the service road will be within 0.4 miles of the Swanson River. Route alignment was developed to include a minimum 300-foot buffer from surrounding lakes wherever practicable.

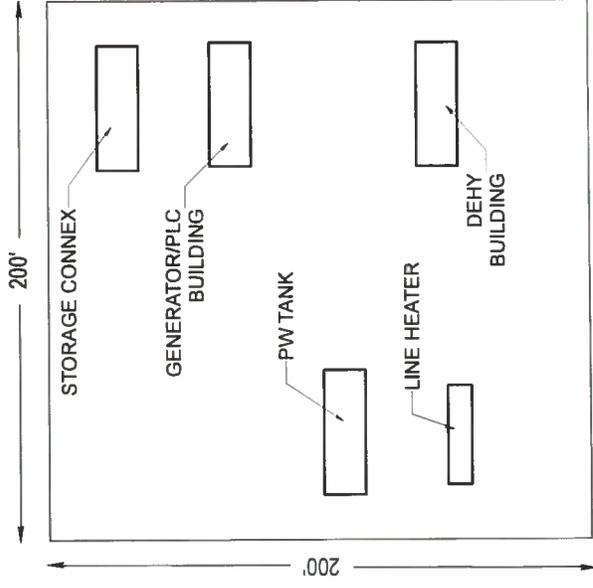
100'



- NOTES:
1. CONSTRUCT METER FACILITY ON GRAVEL PAD ADJACENT TO SERVICE ROAD PULLOUT
  2. GRAVEL FILL SIMILAR TO PRODUCTION PAD TYPICAL SECTION.
  3. SECURITY FENCE NOT SHOWN FOR CLARITY.

**A METER PAD DETAIL**

SCALE: 1" = 40'



**B PROCESSING PAD**

NOT TO SCALE



SCALE:

NA



Projection: State Plane, Alaska Zone 4, NAD83

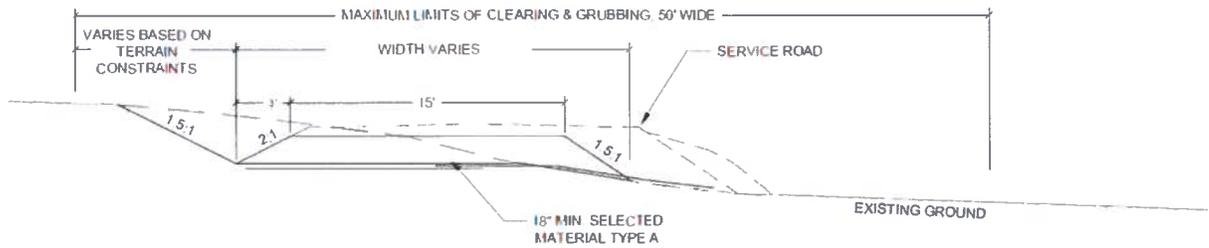


**METER PAD SCHEMATIC & PROCESSING PAD LAYOUT**

SHADURA DEVELOPMENT PROJECT

FIGURE:

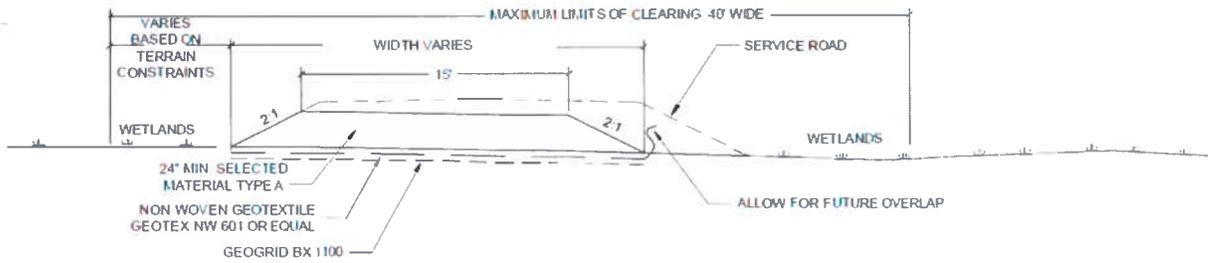
3



**NOTES**

1. MAXIMUM ROAD CLEARING WIDTH IS 50 FT. IN NEARLY LEVEL TERRAIN, REDUCE CLEARING WIDTH TO 40 FT.
2. UTILIZE MULCHING MACHINES FOR CLEARING AND GRUBBING WHERE FEASIBLE.
3. GRAVEL FILL SHALL BE PLACED IN NO GREATER THAN 8" LIFTS AND COMPACTED TO 95% OF MAXIMUM DENSITY.
4. TOP 4" SELECTED MATERIAL TYPE A SHALL BE COBBLE FREE (3" MINUS).
5. GRAVEL FILL SHALL BE UNDERLAIN WITH GEOTEXTILE, SEPARATION GRADE, WHERE SOFT UNDERLYING SOILS ARE ENCOUNTERED.
6. RESERVE TOPSOIL FOR STABILIZATION AND SEEDING ON CUT SLOPES.

**A TYPICAL TESTING ROAD SECTION - UPLANDS**  
SCALE: 1" = 10'



**NOTES**

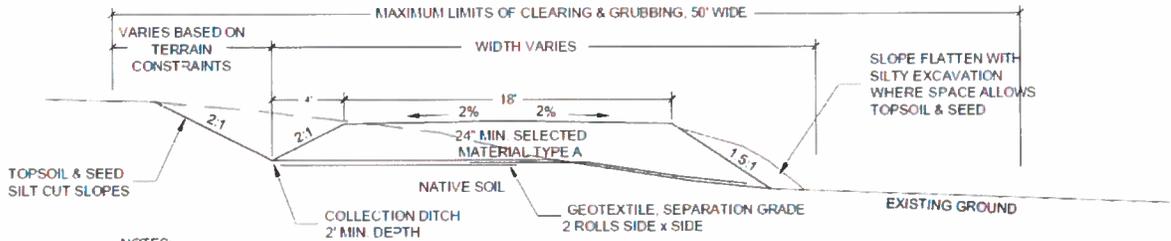
1. GRAVEL FILL SHALL BE PLACED IN NO GREATER THAN 8" LIFTS AND COMPACTED TO 95% OF MAXIMUM DENSITY AS DETERMINED BY AASHTO T 180, METHOD D.
2. TOP 4" SELECTED MATERIAL TYPE A SHALL BE COBBLE FREE (3" MINUS).
3. GRAVEL FILL SHALL BE UNDERLAIN WITH NON WOVEN GEOTEXTILE, GEOTEX NW 601 OR EQUAL.
4. IN WETLAND AREAS GEOGRID BX 1100 OR EQUAL, MAY BE USED TO HELP STABILIZE GRAVEL FILL AS DETERMINED BY THE ENGINEER.

**B TYPICAL TESTING ROAD SECTION - WETLANDS**  
SCALE: 1" = 10'



**TESTING ROAD TYPICAL SECTIONS**  
SHADURA DEVELOPMENT PROJECT

FIGURE:  
**4**

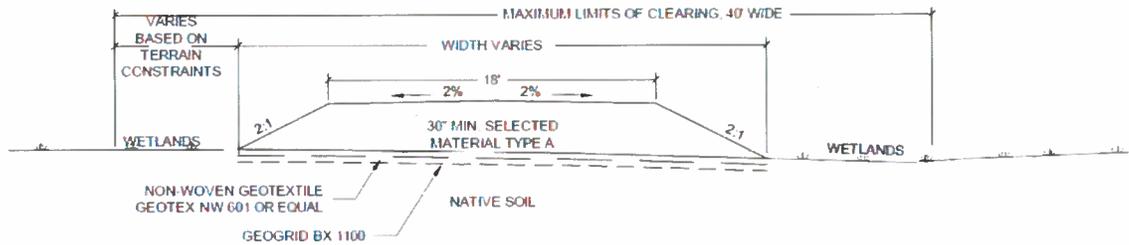


**NOTES**

1. MAXIMUM ROAD CLEARING WIDTH IS 50 FT. IN NEARLY LEVEL TERRAIN, REDUCE CLEARING WIDTH TO 40 FT.
2. UTILIZE MULCHING MACHINES FOR CLEARING AND GRUBBING WHERE FEASIBLE
3. GRAVEL FILL SHALL BE PLACED IN NO GREATER THAN 8" LIFTS AND COMPACTED TO 95% OF MAXIMUM DENSITY.
4. TOP 4" SELECTED MATERIAL TYPE A SHALL BE COBBLE FREE (3" MINUS).
5. GRAVEL FILL SHALL BE UNDERLAIN WITH GEOTEXTILE, SEPARATION GRADE, WHERE SOFT UNDERLYING SOILS ARE ENCOUNTERED
6. RESERVE TOPSOIL FOR STABILIZATION AND SEEDING ON CUT SLOPES.

**A TYPICAL SERVICE ROAD SECTION - UPLANDS**

SCALE: 1" = 10'



**NOTES**

1. GRAVEL FILL SHALL BE PLACED IN NO GREATER THAN 8" LIFTS AND COMPACTED TO 95% OF MAXIMUM DENSITY, AS DETERMINED BY AASHTO T 180 METHOD D.
2. TOP 4" SELECTED MATERIAL TYPE A SHALL BE COBBLE FREE (3" MINUS).
3. GRAVEL FILL SHALL BE UNDERLAIN WITH NON-WOVEN GEOTEXTILE, GEOTEX NW 601 OR EQUAL.
4. IN WETLAND AREAS GEOGRID, BX 1100 OR EQUAL, MAY BE USED TO HELP STABILIZE GRAVEL FILL AS DETERMINED BY THE ENGINEER.
5. IN WETLAND AREAS CONTRACTOR MAY NOT PLACE FILL, REMOVE NATIVE MATERIAL, OR RUN EQUIPMENT OUTSIDE DESIGNATED CONSTRUCTION ZONE AS MARKED IN FIELD BY THE ENGINEER.

**B TYPICAL SERVICE ROAD SECTION - WETLANDS**

SCALE: 1" = 10'

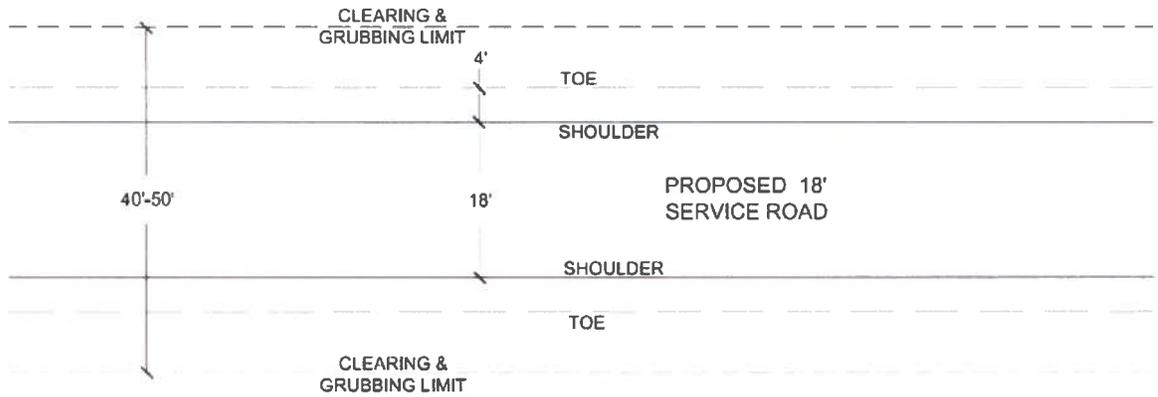


**SERVICE ROAD TYPICALS SECTIONS**

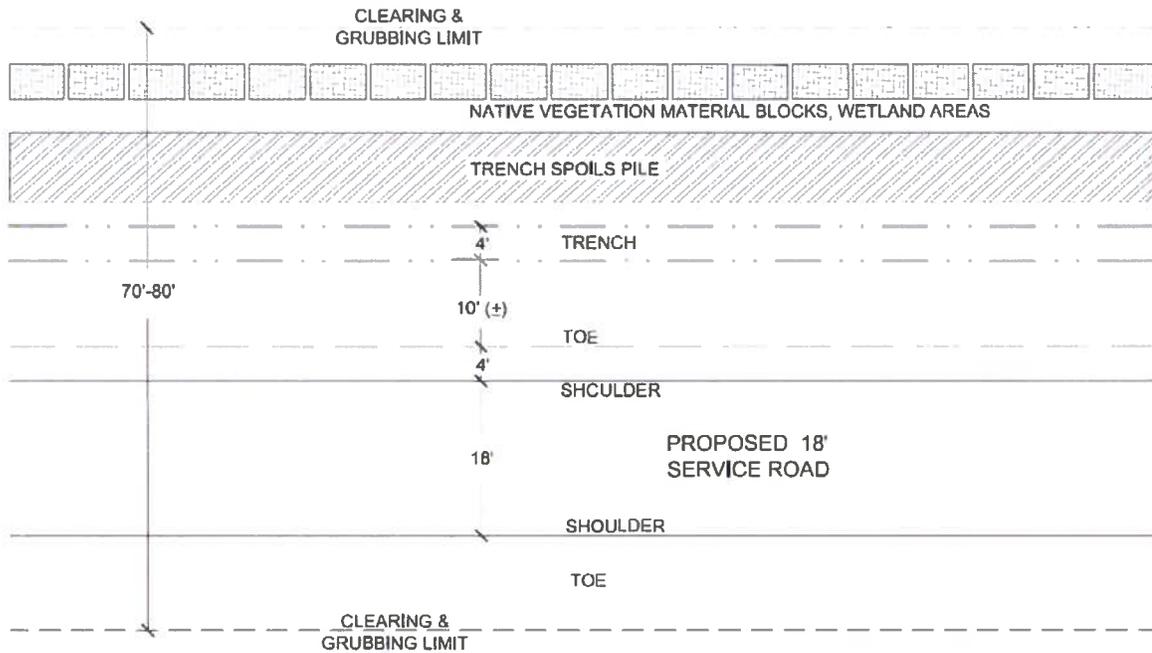
SHADURA DEVELOPMENT PROJECT

FIGURE:

**5**



**A** TYPICAL SERVICE ROAD PLAN VIEW  
SCALE: 1" = 20'



**B** TYPICAL SERVICE ROAD & PIPE TRENCH PLAN VIEW  
SCALE: 1" = 20'



NORTH SLOPE BOROUGH  
KNOWLEDGE AND VISION FOR ALASKA



**TYPICAL SERVICE ROAD  
PLAN VIEW**

SHADURA DEVELOPMENT PROJECT

FIGURE:

**6**

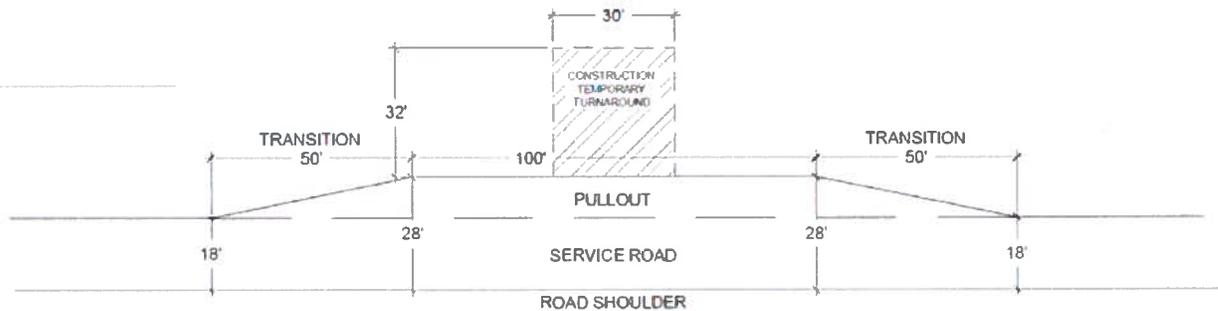


**NOTES:**

1. FIELD FIT AT 400-500 FT. INTERVALS TO MINIMIZE CLEARING AND EXCAVATION.
2. GRUB ONLY LARGE STUMPS.
3. PLACE FILL ON GEOTEXTILE FABRIC TO FACILITATE PICKUP AND REMEDIATION.

**A TYPICAL CONSTRUCTION TURNAROUND - SERVICE ROAD**

SCALE: 1" = 40'

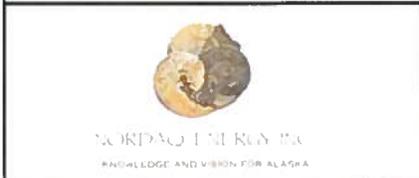


**NOTES:**

1. PULLOUTS WILL BE INSTALLED AT 1/4 MILE INTERVALS. ADDITIONAL PULLOUTS WILL BE CONSTRUCTED WHERE HILLY TERRAIN AND LIMITED SITE DISTANCE ARE PREVALENT.
2. TEMPORARY CONSTRUCTION TURNAROUNDS WILL BE BUILT AT EACH PULLOUT AND FIELD FIT TO MINIMIZE CLEARING.
3. GRAVEL FILL SHALL BE PLACED IN NO GREATER THAN 12" LIFTS AND COMPACTED.
4. GRAVEL FILL SHALL BE UNDERLAIN WITH GEOTEXTILE TO FACILITATE TEMPORARY TURNAROUND REMOVAL.
5. PULLOUTS & CONSTRUCTION TEMPORARY TURNAROUNDS USED FOR BOTH TESTING CONFIGURATION & PRODUCTION CONFIGURATION.

**B TYPICAL SERVICE ROAD PULLOUT**

SCALE: 1" = 40'



**TYPICAL SERVICE ROAD  
PLAN VIEW**

SHADURA DEVELOPMENT PROJECT

FIGURE:  
**7**

### **Gathering Lines and Fiber Optic Cable**

The following gathering lines and utility line will be constructed in a trench within the service road ROW (Figure 6):

- One primary 8-inch maximum diameter gathering line for transport of natural gas. The primary natural gas primary gathering line will be designed and constructed to comply with accepted industry practices and codes, and for a maximum allowable operating pressure (MAOP). A typical MAOP is about 1,300 pounds per square inch gauge (psig). Before being put into service, typically the primary gathering line will be hydro tested to 150 percent of the MAOP.
- One backup 8-inch maximum diameter gathering line. A backup gathering line, constructed of steel or spoolable fiber-reinforced pipe will be constructed in addition to the primary gathering line to serve several functions. They include:
  - Providing a spare line during routine maintenance and testing;
  - Providing a spare line if the primary gathering line becomes damaged or plugged;
  - Providing a more efficiently sized gathering line as gas production diminishes at the end of the reservoir's life; and
  - Allowing for additional capacity to transport gas in the future, if the need arises.
- One fiber optic communications cable; and
- Power transmission cable.

The backup natural gas gathering line will be designed and constructed to comply with industry standards and practices and after construction will be hydro tested to 150 percent MAOP.

### **Fiber Optic Cable**

Communication between the pads will be by fiber optic cable supplemented by microwave relay. The fiber optic cable will be placed in the gathering line trench running from the Shadura meter pad to the processing and drilling pads.

### **Gravel Source**

Although the 1976 CIRI/U.S./State of Alaska settlement authorizes CIRI and its lessees to make reasonable use of KNWR gravel sources, the Project, as currently planned, will obtain its gravel from Borough-permitted commercial borrow pits outside the Refuge.

### **Miscellaneous Facilities**

Supervisory personnel will use temporary facilities during drilling and well testing operations. It is anticipated onsite personnel accommodations will require trailers on the production pad, including one or more of the following:

- Office trailer,
- Living quarter trailers to accommodate the day Company Man and day tool pusher,
- Skid-mounted trailer with sinks and toilets used as a break room, and
- Mud logging trailers.

No potable water system is proposed. Personnel will rely on bottled water for drinking. Waste and wastewater from the toilets, showers, and sinks in the portable support buildings will be contained in

engineered and permitted holding tanks and then hauled by vacuum truck to an approved sanitation facility for disposal.

Household and approved industrial garbage will be hauled to the KPB Central Landfill. The drill crews, generally numbering up to 20 people, will commute from off-refuge housing to work 12-hour shifts.

**(d) Term of years needed**

Following successful completion of drilling, wells will be tested to determine reservoir quality and deliverability per AOGCC requirements. All steel welded, double-walled tanks utilized in testing to contain fluids will be placed in bermed and lined cells to contain drips, splashes and spills.

Project life is estimated to be 30 years. New technologies developed during the course of the Project; however, could prolong the productive life of the Project.

**(e) Time of year for use or operation**

Operation of the Project will occur year round.

**(f) Volume or amount of product to be transported**

It is anticipated that the six natural gas wells will produce about 50 million cubic feet/day (mmcf/day) for processing and delivery to the CPANG pipeline.

**(g) Duration and timing of construction**

NordAq anticipates that construction will begin in the fall of 2012 with surveying of the service road and continue through 2013. The maximum anticipated time required for road, facility, and gathering line construction is 120 days. Drilling will take 360 days for all intended wells and will commence after the service road and processing pad are completed, but before the gathering line and facilities are completed.

**(h) Temporary work areas needed for construction**

NordAq is applying for an 80-foot wide construction ROW—50 feet for the service road and 30 feet for the gathering lines and fiber optic cable. Temporary disturbed portions of the ROW not needed for ongoing operations and maintenance will be regraded and revegetated after construction activities are completed.

**Temporary Support Facilities**

Contractors will need temporary support facilities during construction. These typically include an office trailer on wheels; break shack and equipment maintenance area. No temporary on-refuge living quarters will be required for construction crew.

Initially, temporary facilities will be staged at off-refuge gravel pads along the North Kenai Spur Highway in the Nikiski and Bishop Creek Area, and then will be moved to the meter pad after its construction. All temporary facilities will be removed at the end of construction activities.

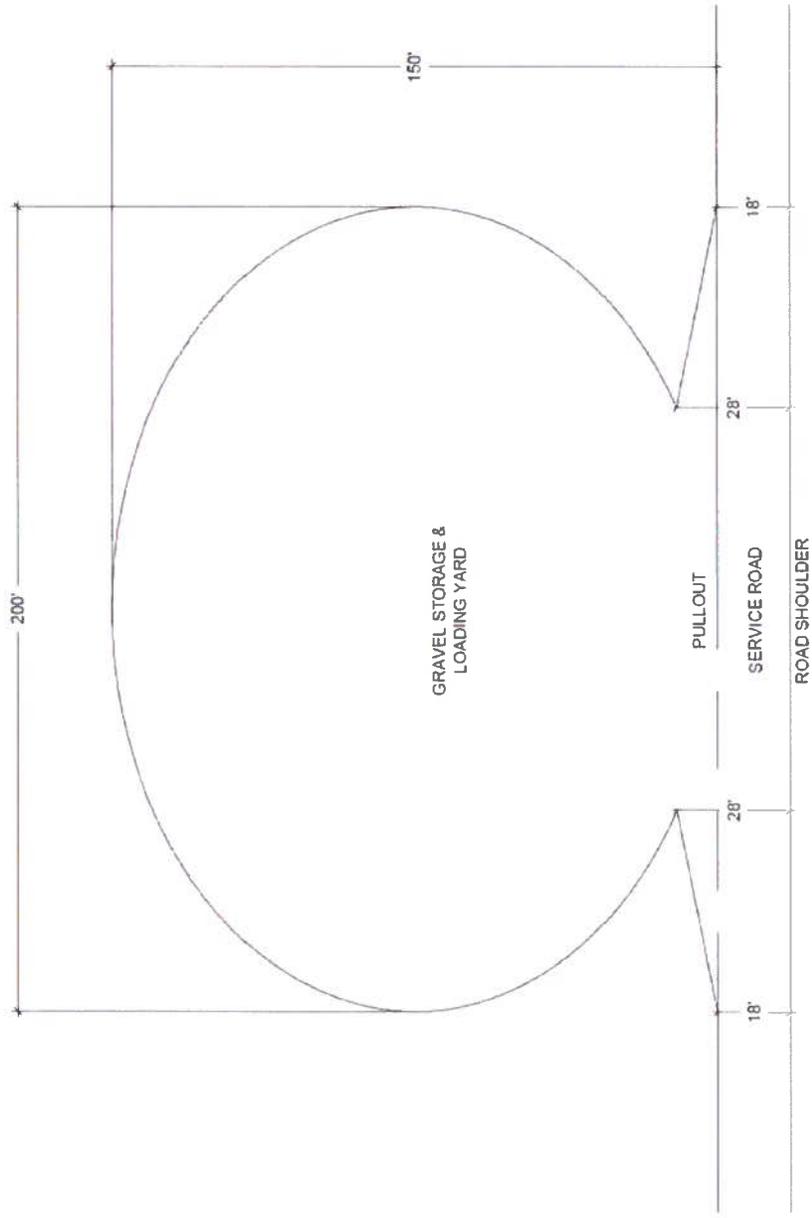
**Gravel Handling Pad Both on State Land**

During construction of the testing road, NordAq will construct two gravel storage and loading yards. Both yards will be on State of Alaska lands—one at the end of the KPB right of way and the second immediately north of the KNWR boundary with ADNDR lands (Figure 1) at the location of the processing pad. These 100-foot by 200-foot yards will be used for transferring gravel from tractor trailer rigs to end

dumps for construction (Figure 8). The gravel handling pad at the end of the KPB right of way will become a vehicle turn around; and the one near the KNWR boundary will be integrated into the processing pad.

**BOX 8 – MAP COVERING AREA AND SHOWING LOCATION OF PROJECT PROPOSAL**

Figure 9 shows the general location of the Shadura Natural Gas Development Project.



- NOTES:
1. GRAVEL HAULED TO YARD WITH TRACTOR TRAILER RIGS (SIDE DUMPS)
  2. MATERIAL STOCKPILED AND LOADED ONTO END DUMPS FOR CONSTRUCTION
  3. GRAVEL STORAGE & LOADING YARDS LOCATED AT MILE 0.4 & 1.4
  4. GRAVEL STORAGE & LOADING YARDS USED FOR BOTH THE TESTING & PRODUCTION ROAD CONFIGURATIONS

**A GRAVEL STORAGE & LOADING YARD**

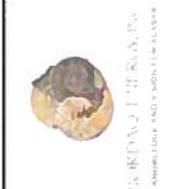
SCALE: 1" = 40'



ALASKA  
Project Location

Projection: State Plane, Alaska Zone 4, NAD83

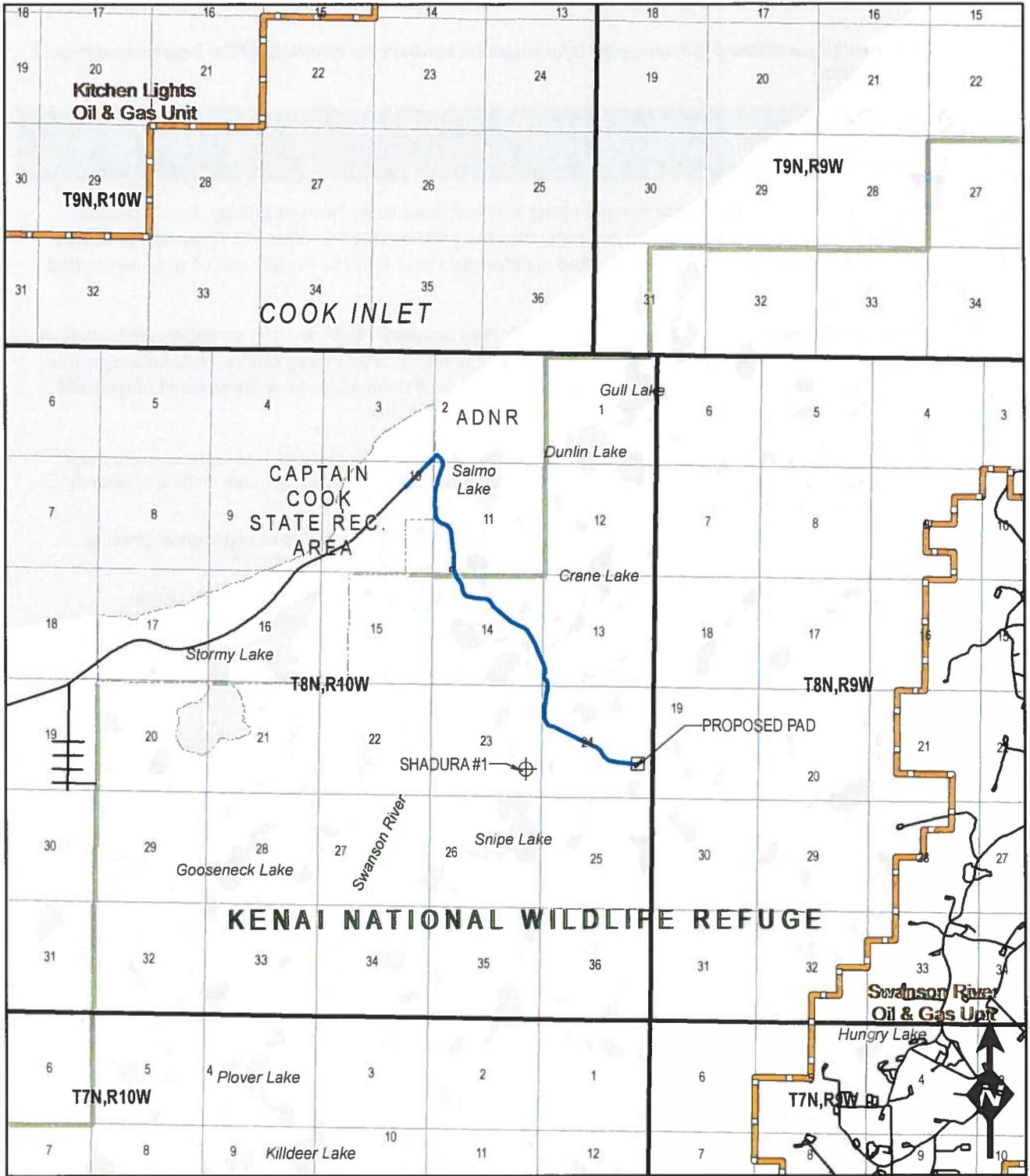
SCALE: NA



**GRAVEL STORAGE & LOADING**

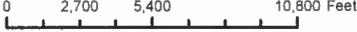
SHADURA DEVELOPMENT PROJECT

FIGURE: 8



 Shadura #1	<b>Administrative Boundaries</b>
 Proposed Route	 Kenai National Wildlife Refuge
 Roads	 Captain Cook State Recreation Area
 Oil & Gas Unit Boundaries	
 Proposed Pad	

**SCALE:**



Projection: State Plane, Alaska Zone 4, NAD83



**GENERAL LOCATION MAP**

**SHADURA DEVELOPMENT PROJECT**

**FIGURE:**

**9**

## 12 – TECHNICAL AND FINANCIAL CAPABILITY TO CONSTRUCT, OPERATE, MAINTAIN AND TERMINATE SYSTEM.

The Shadura Natural Gas Development Project will be developed by NordAq Energy, Inc., a privately owned exploration and development company. NordAq has both the technical and financial capability to construct, operate, maintain, remediate, and appropriately terminate the Project and all of its associated activities.

**Technical Capability:** While NordAq is a relatively new company, its Board and management team have a proven track record and seasoned understanding of Alaska's oil and gas industry. NordAq's team has over 80 years experience drilling oil and gas world-wide, with many of those years spent in Alaska and specifically in the Cook Inlet. NordAq's experienced team includes:

- President and Chief Operating Officer Bob Warthen, a geologist who has worked in the Cook Inlet oil industry for 40 years, including as a former Regional Manager with Unocal Alaska for 25 years.
- Chairman and Chief Executive Officer John Kidd, who has decades of experience directing numerous public companies in the United States and the United Kingdom.
- Chief Technical Officer Hugh North, oil executive and geoscientist who has 30 years international exploration experience, including as the former Executive Director of Thomson North Sea and Former Exploration Manager of British Borneo plc.
- Vice President of Operations Peter Dickinson, who has 15 years oil and gas experience, most of it in the Cook Inlet, Alaska.

NordAq has also contracted some of this Project's construction and design activities to contractors that specialize in this field, including Sam McLane of McLane Consulting and Stephen Hennigan of Petroleum Engineers Inc.

Importantly, NordAq's recent success with its Shadura #1 Exploration Project demonstrates NordAq's ability to operate successfully within the KNWR. NordAq mobilized in early December 2010, built an ice road, drilled an exploration well to approximately 14,000 feet, tested the well, confirmed a significant natural gas discovery at the location, and demobilized the rig five months later in April of 2011. NordAq subsequently returned to the Shadura#1 well using a Low Pressure Vehicle (LPV) trail in 2012. The LPV trail supported the mobilization of logging and testing equipment to gather additional downhole data that resulted in the relocation of the drilling pad to the east. Adapting their program to gather data for informative decisions resulted in refined project description with potential reduced impact. The execution of NordAq's exploration and testing program was conducted in a safe and environmentally responsible manner.

**Financial Capability:** NordAq Energy, Inc. has a large number of shareholders, some of whom have already devoted substantial capital to initial exploration completed in April 2011. As such, the company has access to ample investment capital to undertake the Project. NordAq's 2010/2011 winter Exploration Drilling Program at Shadura #1 represented a significant financial commitment from the company, investing millions of dollars for exploration. Given the success of the exploration program, key NordAq shareholders plan to make significant financial investments to ensure that the development, production and operation of this Project is successful. Additionally, as demonstrated with the Shadura #1 exploration project, NordAq can provide sufficient performance guarantees to the USFWS.

**BOX 13A- B –REASONABLE ALTERNATIVE ROUTES AND MODES CONSIDERED AND REASONS WHY ALTERNATIVES WERE NOT SELECTED.**

NordAq considered several development and alternative routes for the service road for the Shadura Natural Gas Development Project, concluding that Alternative C, the proposed siting of infrastructure and routing of service roads (see Figure 1) results in the most reasonable alternative based on a balancing of economic and environmental considerations. All considered alternatives, including two alternatives which will not require use of KNWR surface at this time (Off-Refuge Directional Drilling and Deferred Development), are discussed below.

**1. Directional Drilling from Off the KNWR from the Processing Pad**

The proposed drilling pad is located the geologic center of the natural gas reservoir of the Shadura Natural Gas Development Project. Using the results of the 2012 logging and testing, NordAq has determined that this location will maximize potential production while minimizing disturbance and impacts. Conventional development of natural gas reservoirs in the Cook Inlet area typically involves two to three 400-foot by 500-foot pads, which altogether will encompass 400,000—600,000 square feet. NordAq proposes to accomplish the Project using a single 600-foot by 600-foot gravel drilling pad and a off refuge 200-foot by 200-foot processing pad that will encompass 0.92 acres.

NordAq proposes to use advanced extended reach rotary steerable technology to develop more of the reservoir from a single area than would be possible using the conventional multi-pad development. From the proposed location of the drilling pad, NordAq will be able to reach most of the “known field” using a large drill rig (2,000 horsepower) and advanced horizontal and directional drilling technology and techniques. The Project targets multiple potential gas-bearing zones that extend from Beluga Formation sands to middle Tyonek Formation sands. With directional drilling, lengths of well bores into these zones could exceed 20,000 feet, which would be near the maximum lengths that NordAq could drill with a 2,000 hp drill rig.

NordAq also investigated the possibilities of locating the drilling pad and service road off KNWR altogether or locating the processing pad closer to the meter pad. The goal of these investigations was to determine if NordAq could accomplish the Project without constructing any facilities on the KNWR or by shortening the length of service road constructed on the KNWR. The closest site off KNWR that is capable of staging the Project is 4.3 miles away. This location will require NordAq to directionally drill more than 5 miles, which would require a large extended reach drill (ERD) rig. Similarly, moving the production pad toward the meter pad would push overall lengths of the well bores beyond the capabilities of the 2,000-horsepower drill rig and into the requirements for an ERD rig. In either case, such an ERD rig is not available in Alaska and it would be cost prohibitive to transport one to the state for this Project.

**2. Defer Construction/Production to Later Date**

NordAq's 2010-2012 exploration activities provided sufficient justification to proceed with full-scale development plans. Proceeding in this manner will maximize development efficiencies, minimize development impacts and expedite the delivery of much needed natural gas supplies to Southcentral Alaska. Additionally, the development deferral alternative is inconsistent with the subsurface development entitlement rights granted to CIRI in the KNWR under its 1976 settlement with the United States and State of Alaska. CIRI has a duty to its shareholders to proceed with the timely development of its coal, oil and gas estate located in the KNWR.

### **3. Alternative Routes Considered**

The detailed wetlands information provided below for each of the alternative routes (Figure 10) is based in part on field work done in support of a Preliminary Jurisdictional Determination (PJD) required by the U.S. Corps of Engineers as part of the 1977 Clean Water Act: 40 CFR Part 325 - Section 404(b)1 permitting process. A wetlands field survey was conducted July 20 and July 22, 2011 for the project as defined in September 2011.

#### **3.1. Alternative Route A**

Alternative Route A follows a Kenai Peninsula Borough (KPB) ROW north from the Captain Cook State Recreation Area (CCSRA) about 0.3 miles along a 30-foot wide, unimproved trail used by area residents to access homesteads and recreational trails. The route then enters ADNR lands and travels east, north of Salmo Lake then in a southerly direction in and out of ADNR property for 1.1 miles along the eastern portion of the site. Passing onto KNWR land, this route continues for an additional 4.4 miles to the Shadura drilling and processing pad.

By itself, this route:

- Consists of approximately 4.6 miles of service road, including 23 permanent turnouts from the end of the North Kenai Spur Highway to the production pad;
- Will impact approximately 0.68 acres of KNWR wetlands and encounter approximately 4.65 acres of upland KNWR habitats and 4.67 acres of State uplands;
- Includes 4.6 miles of buried natural gas gathering lines, power cable, and fiber optic cable running along the service road;
- Crosses one anadromous stream; and
- The ROW alignment is within 300 feet of several lakes in the northern segment.

This alternative was eliminated because its greater length would have resulted in more clearing and construction, a large portion of both taking place within prime bear denning habitat and forest found on both ADNR and KNWR lands.

#### **3.2. Alternative Route B**

Alternative Route B follows the CCSRA ROW north for approximately 0.3 miles then east onto ADNR land about 0.1 miles before intersecting the Nikiski Pipeline ROW to the south for about 0.3 miles. A short spur road for a Meter Pad will veer off east 0.2 miles at this point where the road continues southeast 1.2 miles to the through the center of the project site south of Salmo Lake before entering KNWR continuing for 1.8 miles to the drilling and processing pad.

By itself, this route:

- Consists of approximately 4.27 miles of service road, including 15 permanent turnouts from the end of the North Kenai Spur Highway to the production pad;
- Will impact approximately 0.65 acres of ADNR wetlands and 0.79 acres of KNWR wetlands and encounter approximately 4.55 acres of KNWR upland habitats and 3.31 acres of State uplands;
- Includes 3.9 miles of buried natural gas gathering lines and fiber optic cable running along the service road;
- Crosses two anadromous streams and one non-anadromous stream; and
- The ROW alignment is within 300 feet of several lakes in the northern segment.

This alternative was eliminated because it clears more forest, is partially located within prime bear denning habitat, is in close proximity of lakes, and segments forested habitat found on both ADNR and KNWR lands.

### **3.3. Alternative Route C-Preferred Alternative**

This route follows the CCSRA ROW for approximately 0.3 miles then east about 0.1 miles before intersecting the Nikiski Pipeline ROW to the south for about 0.3 miles. A short proposed spur road for a Meter Pad will veer off east 0.2 miles at this point where the road continues south approximately 1.2 miles along the west edge of a lake just north of the KNWR boundary where the processing pad will be located. The service road then travels south and east for 2.1 miles to the drilling pad.

By itself, this route:

- Consists of approximately 4.2 miles of service road, including 15 permanent turnouts from the end of the North Kenai Spur Highway to the production pad;
- Will impact approximately 0.29 acres of ADNR wetland and 1.38 acres of KNWR wetland and encounter approximately 4.49 acres of KNWR upland habitats and 2.27 acres of State uplands;
- Includes 4.2 miles of buried natural gas gathering lines and fiber optic cable running along the service road; and
- Crosses two anadromous streams and one non-anadromous stream.

Alternative Route C is the preferred alternative because it traverses the upland/wetland fringes, avoids wetland and forest impacts to the least amount possible, causes the least amount of impact to bear denning and fishing habitat, and best utilizes the existing ice road permitted in 2011.

### **3.4. Alternative Route D**

Alternative Route D uses the existing Swanson River Oil Field (SROF) infrastructure to access the proposed pad from the east. This route would part from existing SROF infrastructure and then follow a route north in upland habitat approximately 1500 ft before heading west 2.6 miles to the proposed drill pad. In this alternative, the production would be transported via the pipeline and production scenario described in Alternative C.

By itself, this route:

- Consists of approximately 3.21 miles of service road, including 16 permanent turnouts from the turn off of the SROF road;
- Will impact approximately 1.31 of KNWR wetlands and encounter approximately 5.7 acres of KNWR upland;
- Includes 3.21 miles of buried natural gas gathering lines and fiber optic cable;

This alternative was eliminated because of the travel distance and costs for construction and operation, and the unknown commercial terms from the current operator of SROF.

### 3.5. Alternative Route E

Alternative Route E parallels the existing pipeline SWOF pipeline ROW west for approximately 2.5 miles then north about 2.7 miles along upland complexes to the Shadura drilling pad. In this alternative, the production would be transported via the pipeline and production scenario described in Alternative C.

By itself, this route:

- Consists of approximately 5.5 miles of service road, including 16 permanent turnouts from the end of the North Kenai Spur Highway to the production pad;
- Will impact approximately 1.33 acres of KNWR wetlands and encounter approximately 10.59 acres of KNWR upland;
- Includes 5.5 miles of buried natural gas gathering lines and fiber optic cable running along the service road;

This alternative was eliminated because of the travel distance and costs for construction and operation, and the unknown commercial terms from the current operator of SROF.

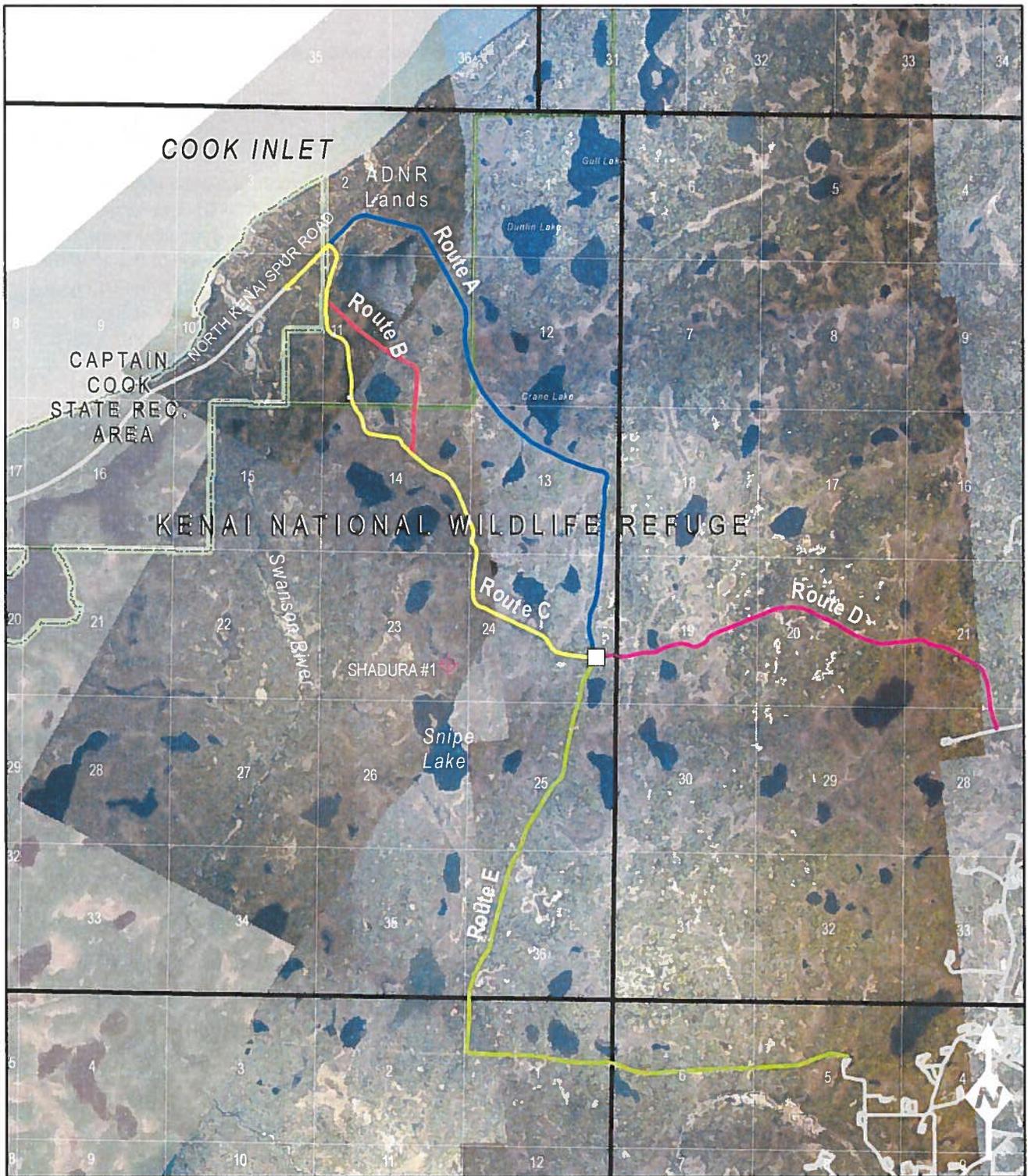
### 3.6. Summary Comparison of Alternative Routes

Alternative Route C was selected as the preferred route when balancing its avoidance of wetlands and forests, small impacts to bear denning and fishing habitat, and utilization of the existing ice road permitted in 2011. Table 1 provides a comparison of the route length and the areal extent of wetlands, uplands and forested areas for each alternative route that was considered.

**Table 1 Estimated Route Length and Areal Extent of Wetlands and Uplands Areas**

Routes	Wetland		Upland	
	Linear Feet	Acres	Linear Feet	Acres
A	1,706	0.70	22,597	9.33
B	3,522	1.45	19,032	7.86
C	3,949	1.63	18,607	7.68
D	3,177	1.31	13,819	5.7
E	3,230	1.33	25,635	10.59

The highlighted Route C is the preferred route.



Shadura #1	Administrative Boundaries	Routes	Route C
Roads	Kenai National Wildlife Refuge	Route A	Route D
Proposed Pad	Captain Cook State Recreation Area	Route B	Route E

**SCALE:**

Projection State Plane, Alaska Zone 4, NAD83



## ALTERNATIVE ROUTES

### SHADURA DEVELOPMENT PROJECT

**FIGURE:**  
**10**

**BOX 13C – GIVE EXPLANATION AS TO WHY IT IS NECESSARY TO CROSS FEDERAL LANDS.**

The project's drilling and production program targets multiple gas bearing zones extending from Beluga Formation sands at 6,000 ft TVD to middle Tyonek Formation sands at 14,500 ft TVD. To reach these zones from an off-refuge pad, NordAq would need an ERD rig capable of directionally drilling more than five miles. Such a rig is not available in Alaska and would be cost prohibitive to transport to the state for this project. Accordingly on-Refuge infrastructure proposed by this project is necessary for the timely development of the Shadura gas reservoir located on the CIRI subsurface estate, currently leased to NordAq. A denial of the requested Title XI ROW would be inconsistent with the clear intent of the 1976 CIRI/U.S./State of Alaska settlement, which made these lands available to CIRI for exploration and development.

**BOX 14 – AUTHORIZATIONS AND PENDING APPLICATIONS FILED FOR SIMILAR PROJECTS WHICH MAY PROVIDE INFORMATION TO THE AUTHORIZING AGENCY.**

Authorizations associated with NordAq's 2010/2011 exploration activities provide extensive information about NordAq and its previous activities associated with the Shadura prospect. Pending applications associated with the proposed future development will contain additional information. Past authorization and pending application information can be made available upon request. Applications for the following permits have been or will be submitted:

**Table 2 Permit Applications**

<b>Agency</b>	<b>Permit Application/Requirement</b>
<b>Federal Agencies</b>	
US Fish and Wildlife Service (USFWS)	Special Use
USFWS SF299	Utilities ROW – pipeline and road
US Army Corps of Engineers (USACE)	Clean Water Act - Section 404.b(1)
Environmental Protection Agency (EPA)	Spill Prevention and Countermeasures Plan
<b>State Agencies</b>	
AK Dept. of Natural Resources (DNR), Div. of Lands	
DNR State Historic Preservation Office (SHPO)	Cultural Clearance - Section 106 Compliance Cultural Resource Permit for surveys
AK Dept. of Transportation & Public Facilities	Utility ROW Authorization and Potential Encroachment Permit
DNR, Division of Mining, Land & Water (DMLW)	Temporary Water Use
DNR-DMLW	Pipeline ROW lease / easement Land Use Permit
Alaska State Fire Marshall	Plan Review & Fire System Permit
Dept. of Fish & Game (ADF&G)	Title 16 Fish Habitat Protection Permit
AK Oil and Gas Conservation Commission (AOGCC)	Permit to Drill and Sundry Notice
AK Dept. of Environmental Conservation (ADEC)	Temporary Storage of Drilling Waste
ADEC, Division of Water	Wastewater General Permit (hydrostatic testing)
ADEC, Division of Water	APDES - Construction/Excavation Dewatering
ADEC, Division of Water	Section 401 Water Quality Certification (or waiver)
ADEC, Div. of Environmental Health	Temporary Storage of Drilling Waste
ADEC, Div. of Air Quality	Air Quality Minor General (MG1) Permit
ADEC, Div. of Air Quality	Title I Air Quality Permit
Environmental Protection Agency (EPA)	Spill Prevention and Countermeasures Plan

**BOX 15 – PROVIDE STATEMENT OF NEED FOR PROJECT, INCLUDING THE ECONOMIC FEASIBILITY**

CIRI owns the coal, oil, and gas estate in the project area as a result of bargains reached in the Cook Inlet Land Exchange, a 1976 CIRI/U.S./State settlement. The lands were included in the settlement due to their likely resource values. CIRI leased the lands to NordAq for the purpose of realizing an economic benefit from the lands, consistent with the intent of the 1976 settlement. NordAq has completed initial testing of the gas deposit and has determined that further development is economically feasible and should be pursued in accordance with the terms and conditions of the CIRI lease. NordAq's determination is consistent with decisions to proceed that have been made by other Lessees within, and in the vicinity of, KNWR.

The Cook Inlet region of Southcentral Alaska currently produces more than 200 billion cubic feet of natural gas per year for consumption and export. More than one-half of Alaskans rely on Cook Inlet natural gas to generate electricity and heat homes and businesses. The local natural gas company, ENSTAR Natural Gas Company, serves more than 100,000 customers, and gains 1,500 to 2,000 new accounts annually. The demand for natural gas in Southcentral Alaska is projected to increase significantly over the next decade. Southcentral Alaska's known natural gas reserves are in steep decline, and state and federal political leaders and regulators, together with the regional public utilities, have been moving aggressively to identify options to meet future energy demand.

The purpose of NordAq's proposed Project is to bring new natural gas reserves into production to continue to meet the energy needs of the Cook Inlet region. NordAq anticipates up to 50 mmcf/day of natural gas to be generated during the life of this Project, with significant initial gas volumes available in the near term. The significant new gas volumes likely to be associated with the Shadura Natural Gas Development Project can be brought on line quickly, helping to alleviate the anticipated Cook Inlet Basin gas shortages and probable disruption of heat and electricity delivery to Cook Inlet Basin residents and businesses.

Developing Alaska's natural gas resources is vital to the State's economy and the wellbeing of its citizens. The proposed Project will maintain or increase the existing level of construction and oil and gas field support opportunities for Alaskan vendors and service workers on the Kenai Peninsula, where the unemployment rate currently exceeds the statewide average.

A continued supply of Cook Inlet natural gas will also ensure that utilities can continue to provide low-cost heat and electricity. Chugach Electric Association, the dominant electric utility in Southcentral Alaska, relies on natural gas for 90 percent of its generating capacity. Cook Inlet residents currently enjoy gas prices that are still well below the national average.

NordAq has demonstrated the financial and technical wherewithal to produce the natural gas reservoir it has discovered on its CIRI lease within the KNWR. Other comparable developments within and outside of the KNWR have clearly demonstrated the technical and economic feasibility of this scale of operation at this location.

**BOX 16. DESCRIBE PROBABLE EFFECTS ON THE POPULATION IN THE AREA, INCLUDING THE SOCIAL AND ECONOMIC ASPECTS, AND THE RURAL LIFESTYLES.**

The Project would provide positive economic benefits for the local and State economies. In the short term, construction of the service road, utility corridor, production facilities, and drilling of up to six natural gas wells would increase employment directly. After construction, maintenance and ongoing operations would require continued direct employment, albeit at a lower level. Indirectly, vendors who provide services and goods to support the construction program and subsequent ongoing operations would experience economic benefits. Although the number of new long-term jobs created for local residents and business opportunities for local vendors would be limited, they would be nonetheless important to the economy in the Kenai Peninsula, where the unemployment rate currently exceeds the statewide average.

With successful natural gas exploration, subsequent production would last up to 30 years, which would lead to additional long-term economic benefits to the surrounding community. Production would provide royalty income to CIRI, contributing significantly to CIRI's economic well-being. Production also would generate tax revenue for the state of Alaska. *In sum, impacts on the economy would be positive and minor to moderate.*

Construction of the Project is not expected to noticeably affect subsistence activities on the KNWR. There is customary and traditional use of moose in ADF&G Game Management Unit 15(a), which encompasses the project area, that allows qualified subsistence users several more days to hunt before the regular hunting season opens in August. Construction activities are not expected to occur during the moose hunting season. Although rural Alaskan residents are eligible to subsistence fish on the KNWR for traditional species, no known subsistence fishing occurs within the project area. *Consequently, impacts on subsistence are expected to be negligible, if they occur at all.*

The Project would develop additional recoverable natural gas reserves needed in Southcentral Alaska (See response to Question 15). The Project's production would help alleviate the anticipated near-future shortages of natural gas in the Cook Inlet Basin and probable disruption of heat and electricity delivery to residents and businesses in the Cook Inlet Basin. *In sum, any social impacts would be positive and minor.*

**BOX 17. DESCRIBE THE LIKELY ENVIRONMENTAL EFFECTS THAT THE PROPOSED PROJECT WILL HAVE ON: (A) AIR QUALITY; (B) VISUAL IMPACT; (C) SURFACE AND GROUND WATER QUALITY AND QUANTITY; (D) THE CONTROL OR STRUCTURAL CHANGE ON ANY STREAM OR OTHER BODY OF WATER; AND (F) THE SURFACE OF THE LAND, INCLUDING VEGETATION, PERMAFROST, SOIL, AND SOIL STABILITY.**

NordAq would practice responsible environmental stewardship, through the use of modern technology and experience working in sensitive areas, to protect the KNWR's resources and to minimize the Project's potential environmental impacts.

**(a) Air quality**

Air quality impacts were estimated for both construction activities and operations. Construction activities would be short term in duration whereas operations would be long term because they are anticipated to last 30 years. Impacts from constructing the service road, gathering lines, and fiber optic cable would occur on both ADNR and KNWR lands. Impacts from constructing the drilling pad would occur within the KNWR, and impacts from constructing the meter pad would occur on ADNR land. Impacts from operations would be more generalized to the entire project area.

**Construction-related air impacts**

During construction, equipment would generate emissions and fugitive dust—no open burning would occur. Construction equipment would include large earth-moving equipment, skip loaders, trucks, engines, and other mobile sources that may be fueled by diesel or gasoline. This equipment would combust fossil fuels and emit combustion-related pollutants, including NO<sub>x</sub>, CO, PM<sub>10</sub>, PM<sub>2.5</sub>, VOCs, and SO<sub>2</sub>. All construction equipment, mobile sources, and engines would comply with relevant EPA regulations (e.g., 40 CFR Parts 86, 89, 90).

Construction activities, including land clearing, grading, excavation, concrete work, blasting, and vehicle traffic, would generate fugitive dust. This dust would contain respirable airborne particulate matter, including PM<sub>10</sub> and PM<sub>2.5</sub>. All particulate matter emissions would comply with ADEC's regulations (e.g., 18 AAC 50.110).

NordAq has modeled the air emissions for its construction activities using a worst-case (i.e., conservative) scenario. Preliminary results suggest that construction activities would *not* trigger the requirement for a Title I PSD permit, minor or Title V permit, so long as mobile operations qualify as on-road or non-road. In addition, CO<sub>2</sub>-e emissions would not exceed the threshold for requiring mandatory GHG reporting. *Consequently, air emissions generated by construction would be localized, intermittent, and short-term and, as such, would not significantly affect local or regional air quality.*

**Operations air impacts**

NordAq's proposed operations include a drill rig, electrical generators, and production facilities located on a pad within the KNWR. This equipment would combust fossil fuels and emit combustion-related pollutants, including NO<sub>x</sub>, CO, PM, VOCs, and SO<sub>2</sub>. NordAq modeled the emissions that the Project would likely generate during operations using a worst-case (i.e., conservative) scenario; however, it would refine this modeling using vendor-specified emission factors once equipment is selected.

NordAq's preliminary modeling indicates that the Project's operations would not trigger the requirement for a Title I PSD permit. Stationary source emissions, however, would require a minor source permit and

a Title V permit. Operations also are expected to trigger mandatory GHG reporting related to CO<sub>2</sub>-e emissions because emissions would exceed the 25,000 metric tons-per-year threshold that is suggested as a "useful, presumptive threshold for discussion and disclosure" during NEPA review. Neither the Federal Government nor the State of Alaska have a significance threshold for GHGs, nor have either developed GHG reduction goals. Nonetheless, the Project would incorporate technologically feasible, cost-effective measures to minimize GHG emissions.

NordAq would require all sources of emissions to comply with relevant EPA requirements, including: implementing emissions standards equivalent to the Maximum Achievable Control Technology (MACT) standards (40 CFR Part 63) and New Source Performance Standards (NSPS) technology-based emissions standards (40 CFR Part 60). Furthermore, NordAq would adopt numerous mitigation measures to reduce any air quality impacts associated with its construction and operation activities; these measures are listed in the mitigation discussion in the POD. *Given these compliance requirements, NordAq's operations would be permitted by ADEC and would not cause or contribute to a violation of any federal, state, or local air quality standards. The air emissions related to operations would be localized, would be intermittent, would only last for the life of the Project, and would not significantly affect local or regional air quality.*

**(b) Visual impact**

Although the Project would affect an undisturbed portion of the KNWR, the proposed activities were contemplated as part of the 1976 CIRI/U.S./State settlement with the operative language in the settlement requiring that the development activities result in the least practicable temporary and permanent harm to the fish and wildlife habitats in the KNWR. Reasonable visual impacts were assumed to be a result of likely development activities. NordAq's Project would result in reasonable visual impacts that are consistent with visual impacts resulting from comparable oil and gas development activities authorized elsewhere in the KNWR. Consistent with the intent of the 1976 settlement, NordAq fully intends to build upon lessons learned from previous oil and gas developments in the KNWR to minimize visual impacts in the project area. Features of NordAq's Project that would have visual impacts include the service road, gathering lines, fiber optic cable, and the metering and processing pads with their associated equipment. Initial mitigation measures (using sweeping zigzags in forest areas and sweeping curves in wetland areas to avoid a linear path) would help camouflage the road during operations as well as after demobilization. (See Section 10 of the POD for a discussion of mitigation measures.) The gathering lines and fiber optic cable would be buried to minimize their visual impacts.

Some features and practices of the Project would nonetheless create temporary artificial focal points that can interrupt the otherwise natural appearance of the landscape; however, they would be removed at the completion of the Project's useful life. In cleared areas and within the footprint of the production and meter pads, the scenic landscape would be restored at the end of the Project's useful life by replanting trees and seedlings, as well as replacing felled trees. In wetlands with low brush, standing deadwood that was cut would be replaced. This combination of planting and replacing would help restore the altered scenic landscape and would help barricade and camouflage the former road. *In sum, the long-term impact to visual and scenic resources in the project area would be consistent visual impacts contemplated by the 1976 settlement and with comparable oil and gas developments in KNWR.*

**(c) Surface and ground water quality and quantity**

**Surface Water**

Project activities that could affect surface water hydrology include placing gravel fill for the service road and pads, constructing buried gathering lines, conducting drilling operations, and conducting production operations. NordAq estimates these proposed activities would affect 64.5 acres (less than 0.1 percent) of the 37,540-acre Lower Swanson Creek Watershed and 2.6 acres (less than 0.1 percent) of the 15,268-acre Island Lake-Frontal Cook Inlet Watershed. The proposed gravel service road would cross two anadromous streams and one non-anadromous stream; the road ROW would not pass with 100 feet of any lakes or ponds and the route was developed to include a 300-foot buffer from surrounding lakes, whenever practicable.

The Project is not expected to change the character of the surface water runoff in either watershed, and therefore, it is not expected to measurably affect stream flows, surface water routing, or flooding. Although the compacted road bed and gathering line trench may cause some ponding and minor impacts to surficial flows, the extent of these impacts would be limited in size and they would occur intermittently over the duration of the Project. To minimize these impacts, NordAq would employ appropriate design and construction techniques to control erosion and reduce disruptions of natural flow patterns. For example, stream crossings would be built—subject to USFWS and ADF&G approval—using clear-span bridges. *In sum, the impacts on surface water hydrology would be minor, localized, and mitigated, which would result in insignificant impacts to the watersheds.*

**Groundwater**

Project activities at the production pad that could affect groundwater resources include drilling one water well, one Class II disposal well, and as many as five additional natural gas wells. The water well would withdraw up to 126,000 gallons of water per day during drilling, which would occur over the course of one year, but not continuously and the ultimate number of natural gas wells drilled would depend on the testing results and information received. During production, demand for water from the water well is expected to be much lower—500 gallons per day for domestic purposes. Given prior experience in the general vicinity (namely, the lack of impacts associated with a previous 4.2-million-gallon-daily withdrawal for the Nikiski Industrial area), NordAq anticipates no impacts on nearby lakes or surface water from withdrawals of groundwater.

All wells drilled as part of this Project would be properly cased and cemented. Thus, the potential for cross-contamination of aquifers via spaces around the well bores would be negligible.

NordAq would dispose of drilling fluids, cuttings, and produced water into the Class II disposal well. This well would be drilled to a depth of 7,000 to 12,000 feet to ensure disposal is into a saline formation with no geologic connection to the surface aquifers that are used for domestic or industrial wells (which are typically at depths of 65 to 100 feet). Thus, the disposal well is not expected to affect groundwater used for drinking or industrial purposes. *In sum, the impacts on groundwater would be minor, localized, and mitigated, which would result in insignificant impacts to groundwater resources.*

**Water Quality Impacts**

Impacts to water quality from the Project could include sedimentation and turbidity from construction activities, water discharged from hydrotesting, domestic wastewater, and unanticipated hydrocarbon releases and spills. Sedimentation and turbidity could result from clearing and grubbing, constructing the road and pads, trenching, and hydrotesting the gathering lines. NordAq would employ construction and

stabilization techniques to minimize the potential that eroded soil reaches any wetlands, streams, or lakes. These techniques include stockpiling topsoil excavated from the trench within the ROW and adopting appropriate erosion control measures as conditions dictate (cross-drainage structures, grading, seeding, clean gravel or rock blankets, straw bales, silt fences around immediate stream crossings to contain sediment from construction, discharging water into natural depressions, and discharging excavated water into upland areas).

To comply with the State of Alaska water quality standards for turbidity, NordAq would prepare a stormwater pollution prevention plan (**SWPPP**) to comply with the conditions contained in the NPDES General Permit for Stormwater Discharges from Construction Activities and would adopt best management practices to control erosion, sedimentation, and turbidity. The SWPPP would describe the controls adopted to minimize sedimentation and turbidity, and to ensure that discharges follow the limitations on water discharge quality and quantity set forth in regulatory agencies' wastewater discharge permits. NordAq would undertake active monitoring and regularly scheduled inspections to ensure compliance.

NordAq would hydrotest the gathering lines using approximately 100,000 gallons of clean water from its on-site water well. If hydrotesting is conducted during the winter, trace amounts of environmentally safe propylene glycol would be used to depress the freezing point.

There would be no domestic wastewater discharge because sanitary wastes and domestic wastewater would be disposed at an approved facility outside the KNWR. There is always some small risk of a hydrocarbon release or spill, which could affect water quality. Although no spills are anticipated, NordAq would adopt rigorous steps to minimize the risk of a spill and ensure a quick response, including containment measures (berms around pad perimeters, grading to collect run off), compliance with regulatory requirements for fuel storage and transfer, appropriate treatment of hazardous materials, and response planning. *In sum, the Project has the potential to create short-term and localized conditions that could cause erosion, particularly during construction, but NordAq's adoption of best management practices would eliminate or minimize sedimentation and erosion. Long-term impacts on water quality are anticipated to be insignificant relative to the watersheds.*

#### **(d) The control or structural change on any stream or other body of water**

No anticipated control or structural changes to any streams are anticipated. For the service road, NordAq proposes to use single clear span bridges to cross the three recognized streams.

#### **(e) The surface of the land, including vegetation, permafrost, soil, and soil stability.**

##### ***Vegetation and Soils***

Construction of the Project would disturb approximately 37 acres of soils within the proposed 80-foot-wide ROW, 12.3 acres for the drilling and processing pad and 0.2 acres for the meter pad. Although installation of the gathering lines and fiber optic cable would directly disturb soils adjoining the road, the impacts are expected to be insignificant. These soils would be replaced in the same area from where they were trenched. and NordAq would attempt to restore the soils to native densities.

Construction and operation of the Project would result in both short- and long-term impacts to vegetation. NordAq would clear some of vegetation before constructing the road and pads, which could result in localized compaction of the vegetative mat. Construction of the Project's facilities would remove portions of various vegetative communities, including paper birch (10.6 acres), followed in descending order by alder (10 acres), black spruce (7.5 acres), mixed forest (4.6 acres), and black cottonwood (3.2 acres).

Most of the vegetation along the ROW (23 acres) is 21 to 40 years of age. This removal would be a long-term loss of vegetation. Vegetation with sufficient root systems that is not covered by Project facilities would likely re-grow over time—other areas would naturally revegetate. After the Project is decommissioned, however, the areas covered by the road, pads, and other facilities would be returned to as near original physical condition as practicable, with associated biological productivity and diversity.

### **Topography**

The Project does not require large cuts or fills given the low relief in the area. Localized changes in topography would be limited, and include placement of approximately 3 feet of gravel for the service road and pads. Thus, impacts to the topography associated with the roads and pads would be insignificant, with eventual restoration approximating pre-construction conditions.

### **Wetlands**

Construction of the Project would disturb approximately 5.6 acres of wetlands (approximately 2.4 acres on ADNR lands and 8.7 acres on KNWR lands). To the extent practicable, NordAq would avoid high-value wetland impacts by adjusting pad or road locations to avoid wetlands, and implement mitigation measures to minimize the impacts to wetlands that do occur. For example, to avoid draining wetland areas during construction of the gathering lines and fiber optic cable, NordAq would use earth fill or sand bags to fill in the trench; remove water gathered there while the trench is open; adopt buoyancy-control measures for gathering lines installed in wetlands; and use the push-pull technique to install gathering lines in saturated or inundated wetland soil areas. Despite these measures, direct, long-term disturbance is anticipated for wetlands that must be filled.

At most, impacts to wetlands would occur only during the Project's useful life. After the Project's facilities are decommissioned, the road and pads would be restored, the bridges and most of the gravel would be removed, the slopes would be re-contoured to match original topography, and disturbed areas would be replanted with native vegetation. In addition, wetland functions would be restored to mimic as close as possible original functions. The gathering lines and fiber optic cable would be abandoned in place to avoid re-disturbing the soils and vegetation that cover them. Restoration would occur in accordance with the terms and conditions of the ROW permit. *In sum, impacts to vegetation, topography, and wetlands from the Project are anticipated to be local, minor, and would only last for the useful life of the Project.*

**BOX 18. DESCRIBE THE PROBABLE EFFECTS THAT THE PROPOSED PROJECT WILL HAVE ON (A) POPULATIONS OF FISH, PLANTLIFE, WILDLIFE, AND MARINE LIFE, INCLUDING THREATENED OR ENDANGERED SPECIES; AND (B) MARINE MAMMALS, INCLUDING HUNTING, CAPTURING, COLLECTING, OR KILLING THESE ANIMALS.**

***Fisheries***

The ROW would cross three unnamed drainages, one non-anadromous stream from Salmo Lake and two anadromous streams in the Crane Lake Watershed. Rainbow trout and three spine stickleback are present in Salmo Lake. Rainbow trout, coho salmon, Dolly Varden, and long nose sucker are present in the Crane Lack Watershed.

Sedimentation of streams resulting from construction activities is a primary concern for fisheries because it could impact the eggs, larvae, juveniles, and spawning activities of fish present in those streams. NordAq would implement mitigation to minimize erosion and the potential transport of sediment to the streams. For example, single lane, clear span bridges with gravel embankments would be used to cross the streams; silt fences would be erected around each steam crossing; and no permanent structures would be installed in water bodies. To minimize impacts on fisheries NordAq would, in cooperation with ADF&G, select the stream crossing method for gathering lines (e.g., open-cut method, open-cut isolation method, or utilidor attached to bridges) that best matches the specific conditions of the stream and the timing of construction. Finally the production and meter pads would be located more than 100 feet from the nearest lakes, would be graded to allow for drainage and collection of surface runoff, and would have berms that provide adequate containment to prevent contamination of surrounding habitats. *In sum, construction of the Project's facilities is expected to result in only negligible or minor, short-term disturbance of fisheries.*

***Wildlife***

The primary impacts from the Project are associated with long-term clearing of vegetation for the service road, utility corridor, and pads, especially where that vegetation involves wetland, forested, shrub, or herbaceous vegetative communities that provide high-quality foraging, cover, and breeding habitats for wildlife. To the extent practicable, NordAq would avoid high-value habitats, such as high-value wetlands and forests. In addition, to the extent possible, NordAq would clear vegetation in the fall and early winter so it would not destroy bird nests with eggs or young or disturb denning animals during hibernation. Impacts are expected to be minimal because the habitat lost would represent less than 1 percent of the terrestrial habitats, less than 0.1 percent of the wetlands habitats within five miles of the Project.

In addition to habitat loss, alteration, and fragmentation, other potential impacts to wildlife during construction and operation of the Project include (i) disturbance from noise, traffic, and other human activities; (ii) direct mortality from vehicle-wildlife accidents; (iii) indirect mortality from increased access to the area by hunters and other unauthorized users; and (iv) altered survival, mortality, or reproduction because of exposure to spills of fuel or lubricants. NordAq would adopt and strictly enforce a Wildlife Interaction and Bear Avoidance Plan to minimize the impacts of Project personnel and Project activities. *In sum, impacts from habitat loss, habitat alteration, and other Project-related impacts on wildlife are expected to be minimal and short term in nature. Following decommissioning at the end of the Project's useful life, restoration vegetation should eventually result in the Project area returning to its pre-construction habitats.*

***Threatened or Endangered Species***

No species that are federally listed as threatened or endangered under the ESA or proposed for listing as threatened or endangered are known to occur within the project area. In addition, no areas designated as critical habitat or proposed for designation as critical habitat under the ESA are known to occur within the project area. Some species listed by ADF&G as species of special concern or by KNWR as species of special interest; however, may occur within the project area. Construction-related disturbance of wetland, forested, shrub, or herbaceous vegetative communities that potentially provide high-quality foraging, cover, and breeding habitats for these species could adversely impact them. But, NordAq's plans to minimize disturbance to forested habitats and wetlands, schedule vegetation clearing outside of the nesting season, and implement a Wildlife Interaction and Bear Avoidance Plan result in minor impacts on ADF&G listed species of special concern and KNWR species of special interest.

***Marine Mammals***

No marine mammals are in the project area; therefore, marine mammals would not be impacted.

**SUPPLEMENTAL SIGNIFICANCE ANALYSIS UNDER 40 C.F.R. §1508.27**

NEPA requires a thorough review of the potential environmental impacts of decisions before they are made, thereby ensuring that environmental issues are considered and that important information is made available to stakeholders and the general public. The federal agency issuing the permit or authorization is required to take a "hard look" at the environmental consequences, but should do so within the appropriate context. NordAq has conducted a preliminary analysis of the environmental impacts associated with its Project and concluded that, when considered in the context of the exploration and development impacts contemplated under the 1976 CIRI/U.S./State settlement, the Project will not result in significant individual or cumulative impacts on the quality of the human environment as evaluated by the ten possible "significance" factors under 40 C.F.R. § 1508.27(b). Accordingly, NordAq respectfully requests an environmental impact statement (EIS) not be required for issuance of the requested ROW.

***1. Impacts that may be both beneficial and adverse. A significant effect may exist even if the Federal agency believes that on balance the effect will be beneficial.***

In determining the significance of effects of the Project, NordAq considered both adverse and beneficial impacts from the proposed activities. Potential adverse impacts to the physical environment (e.g., disturbance of soils and increased emissions into the local airshed), biological resources (e.g., impacts associated with the removal or disturbance of wildlife habitats and wetlands), with consideration of the mitigation measures incorporated into the proposed activities and voluntary mitigation measures as well (see Section 10 of the POD for a list of mitigation measures), are all expected to be localized, negligible to minor, and, as to certain construction-related impacts, short term in nature. The potential beneficial economic and social impacts for Southcentral Alaska and its local residents, including additional jobs, additional business opportunities for local vendors, and much needed additional natural gas, are expected to be positive and minor. Additionally, the Project results in the significant benefit of enabling CIRI to benefit from subsurface entitlement rights granted to it under the 1976 settlement. Therefore, consideration of both adverse and beneficial effects of NordAq's Project does not render the potential impacts significant.

***2. The degree to which the proposed action affects public health or safety.***

In determining the significance of effects of the Project, NordAq considered the degree to which it may have an effect on public health or safety. NordAq considered the distance of the proposed activities from local communities; the potential effects of the activities on water discharges and air emissions under permits; the low likelihood of a fuel spill; and the potential for the Project to interfere with subsistence activities. The Project area lies within the Kenai Peninsula Borough, which has an approximate population of 54,000, half of which lives in the cities of Kenai, Soldotna, Sterling, Kasilof, and Nikiski. At 5 miles from the project area, Nikiski is the closest community. The Kenai Visitor Center is located about 40 miles northwest of the project area. Goods and services would be obtained from local contractors, when available, and these business interactions are not expected to adversely affect community health. Impacts to water and air quality are expected to be short term and localized at the drill pad and not affect local communities. Fuel spills, if they occur, would be small and will not affect local lakes and wetlands. NordAq's proposed activities incorporate specific mitigation measures regarding timing of activity to avoid interference with subsistence activities. Therefore, consideration of potential effects of the proposed action on public health or safety does not render the potential impacts significant.

***3. Unique characteristics of the geographic area such as proximity to historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas.***

In determining the significance of effects of the Project, NordAq evaluated the degree to which it may impact unique geographic areas. Wetlands are addressed above and no historic or cultural resources, park lands, prime farmlands, wild and scenic rivers, or ecologically critical areas are proximate to the Project area. Furthermore, the proposed ROW and processing pad are located within the KNWR, on CIRI leases that were part of the 1976 CIRI/U.S./State of Alaska settlement. This settlement contemplated oil and gas development in the area that the Project would impact, effectively zoning this area as being available for the exploration for and development of coal, oil, and gas. The activities proposed in this application are consistent with exploration and development activities in other parts of the KNWR where USFWS has allowed oil and gas exploration and development. Following from this, the proposed activities are consistent with the allowable uses contemplated under the 1976 settlement for this portion of the KNWR, whether or not the area is currently affected by comparable activities. Accordingly, the proposed activity does not trigger this criterion as to the need for an EIS.

***4. The degree to which the effects on the quality of the human environment are likely to be highly controversial.***

In determining the significance of effects, NordAq evaluated the degree to which the potential effects of the Project may be highly controversial and reconsidered the comments and issues presented in comment letters received on its prior ice road Environmental Assessment for the Shadura #1 well (see Shadura #1 Exploration Plan EA, November 2010, at pages 49–50) and other stakeholder input. This review indicated there were no substantial questions raised or evidence provided regarding the proposed action's causing significant degradation of the environment. Although generalized concerns about development within the KNWR were expressed, similar exploration and development activities occur in the project area. None of the comments raised specific concerns related to the likelihood or the

significance of adverse impacts associated with the Project.<sup>1</sup> Nor did any of the comments raise credible new information that would bring into question whether the proposed activities would likely result in more than minimal, and in most cases below measurable, effects. The types of activities proposed for this Project are frequently undertaken within the Cook Inlet and other areas, are well understood, and therefore, their associated impacts are easily determined. Operations are conducted in a safe manner with very little impact to the environment. As discussed elsewhere, discharges and emissions would be regulated and restricted by permits in which the limitations would be set based on the known effects of discharge constituents and emissions (criteria pollutants) to ensure that effects are minimal and acceptable. Further, mitigation measures would be incorporated into the proposed activities, including NordAq's commitment to coordinate with those living nearby in the Gray Bluffs area.

Furthermore, the time for controversy regarding whether or not oil and gas development should be allowed in this portion of the KNWR was 1976 when CIRI, the United States, and the State of Alaska struck their bargain, resolving controversies and effectively zoning this area for the exploration and development of coal, oil, and gas. Accordingly, controversy, if it exists, will be based on an uninformed understanding of CIRI's subsurface development rights in the KNWR and the extensive history associated with those rights. Consideration of the potential effects of the proposed activities would not be highly controversial or render potential impacts significant.

***5. The degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks.***

In determining the significance of effects, NordAq evaluated the degree to which the Project's potential effects may be highly uncertain or involve unique or unknown risks. The exploration for and development of natural gas within the KNWR and the Cook Inlet have been occurring for decades and the potential impacts of these activities have been addressed in previous NEPA and planning documents. The 1976 CIRI/U.S./State settlement contemplated the proposed activities. Additionally, NordAq's analysis of the impacts of its Project has found negligible to minor effects on the human environment. These effects are not highly uncertain nor do they involve unique or unknown risks. Therefore, consideration of the degree to which the potential effects of the Project may be highly uncertain or involve unique or unknown risks does not render the potential impacts significant.

***6. The degree to which the action may establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration.***

In determining the significance of effects, NordAq considered the degree to which its Project's potential effects may establish a precedent for future actions or represent a decision in principle about a future consideration. NordAq's ROW application and associated project activities are limited to the specified leases and are consistent with the purpose of the 1976 settlement and the CIRI's leases resulting from that settlement—to allow development of oil and natural gas resources at the earliest practicable time in a manner that causes the least practicable temporary and permanent harm to the fish and wildlife habitats

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<sup>1</sup> Public opposition to a project, in and of itself, does not render a project highly controversial and force a "significance" finding; instead this factor refers to a substantial dispute, supported by evidence, as to the size, nature or effect of the proposed action.

of KNWR. The precedent for authorizing the exploration and development of CIRI coal, oil, and gas estates within the KNWR is already well established. A decision on this application will establish no new precedents relative to CIRI-related authorizations. Therefore, consideration of the degree to which the Project may establish a precedent for future actions or represent a decision in principle about a future consideration does not render the potential impacts significant under this criterion.

***7. Whether the action is related to other actions with individually insignificant but cumulatively significant impacts. Significance exists if it is reasonable to anticipate a cumulatively significant impact on the environment. Significance cannot be avoided by terming an action temporary or by breaking it down into small component parts.***

NordAq has considered the degree to which its Project may be related to other actions with individually insignificant but cumulatively significant impacts. The Project is not directly or causally related to other current actions. NordAq has considered the degree to which the Project may be related to other past, present, and reasonably foreseeable future actions (RFFAs) and whether the incremental impacts from the Project would result in cumulatively significant impacts when combined with other activities that are known to occur or can be reasonably expected to occur at the same time as and in the same vicinity of the Project. The onshore geographical area considered by NordAq was bounded by Nikiski to the south, Muskrat Lake to the east, and Point Possession to the north. The following categories of activities were considered because they have the greatest impact on the terrestrial environment of the Kenai Peninsula: oil and gas extraction; logging and foresting; population growth and urban development; transportation; and recreation and tourism.

**Oil and Gas** Several oil and gas units have been established within the KNWR: Swanson River Unit, Beaver Creek Unit, Birch Hill Unit (operations are currently suspended and the well is scheduled to be plugged and abandoned), and Wolf Lake Facilities (on CIRI subsurface estate). Establishment of these units has led to the subsequent construction of well pads, service roads, and buried pipelines. To support these units and others, two major buried pipelines cross the general area: (i) a natural gas pipeline from ConocoPhillips' Tyonek platform to the Kenai Liquid Natural Gas (LNG) Facility, and (ii) the 40-mile-long Nikiski Alaska Pipeline from Tesoro's Kenai Refinery to the Ted Stevens Anchorage International Airport. Active downstream facilities within the Nikiski area include the Tesoro Kenai Alaska Refinery, Nikiski Terminal, Kenai Pipeline Facility, and the Kenai LNG Facility (which is expected to be mothballed this fall).

RFFAs include Marathon's development of the East Swanson River Satellite Natural Gas Exploration and Development Project on CIRI subsurface estate, for which Marathon received a ROW permit in 2004, as well as the potential for exploration and development on CIRI acreage currently leased to companies interested in exploration and development. NordAq does have other CIRI leases within the KNWR (Tourmaline located on Kenai Peninsula close to Shadura and an area called Shadura South adjacent to this Project) and may pursue exploration and development activities in the future on those leases as well. While NordAq's future exploration on these leases is reasonably foreseeable, no plans have been developed for these leases at this time. NordAq is not aware of any new transport pipelines, trunk lines or sales lines currently planned within the area, nor is it aware of any new refineries or value-added facilities.

As to unleased CIRI lands in the KNWR, and more specifically the geographic area associated with this Project, NordAq is not aware of any CIRI plans future exploration and/or development. CIRI lands within the Refuge have been explored extensively, resulting in third party leases and associated developments, including those noted above. Given historic exploration activities, future development and exploration will likely occur in the vicinity of current CIRI leases within the Refuge, including: the possibility of additional

exploration, or leasing and development immediately adjacent to the NordAq leases (although the subsurface geological attributes providing accumulation of natural gas on the Shadura lease may not be present on adjoining tracts). As noted throughout this ROW application, CIRI exploration and development of its KNWR entitlement lands was assumed under the 1976 settlement, with those activities to occur in accordance with the March 27, 1980 surface use plan approved by the U.S. Fish and Wildlife Service under the 1976 settlement. Accordingly, the framework for CIRI's ongoing and cumulative exploration and development within the Refuge is well established, with most exploration and development likely to occur in areas of the Refuge that are associated with existing CIRI leases or immediately adjacent to those areas.

**Logging and Forest Products.** Logging is a relatively small component of the Kenai Peninsula's economy, but may have long-term effects on the economy. Forested lands encompass 2 million of 10 million acres of the Kenai Peninsula Borough, with commercial forest lands comprising 0.6 million acres. Slightly more than 50 percent (952,390 acres) of the KNWR is considered forest. State forested lands in the Peninsula encompass 54,600 acres of State land on the Kenai Peninsula. The State has three timber sales totaling about 2,000 acres planned over the next five years at an annual allowable cut rate of 400 acres per year; none of the timber sales are within the analysis area. Current logging on private, Kenai Peninsula Borough and State lands on the peninsula is primarily related to the decimation of more than one million acres of spruce from an unprecedented spruce bark beetle infestation during the 1990s. Private and public lands are being logged, or are under consideration for logging, because of the fire hazards presented by large acreages of dead timber. The logging facilities operated by two forest product companies on the Kenai Peninsula are outside the analysis area.

**Population Growth.** The project area lies within the Kenai Peninsula Borough with an approximate population of 54,000 people. More than half of the population lives in or near five cities. Kenai is the largest city and is the center of the Cook Inlet oil and gas industry. The outskirts of Nikiski are about five miles from the project area. The Kenai Peninsula population has increased 500 percent in the past 35 years, with an 11.5 percent increase from 49,000 to 54,000 people in the Kenai Peninsula Borough from 2000 to 2010 (US Census Bureau, 2010). The population of Nikiski increased by only 3.8 percent during the same period, from 4,327 to 4,493, which is accredited to a downturn in oil and gas activity, the main economic source in the town.

**Transportation Corridors.** The Kenai Spur Highway traverses a southern portion of the analysis area. It starts at Kenai and ends at Alaska Department of Transportation Milepost (MP) 38.42 where the existing paved road ends in Captain Cook State Park, and where the proposed service road for the Project would begin. Annual average daily traffic at the junction of the Kenai Spur Highway and Sterling Highway was 13,519 vehicles in 2009. A pioneer trail continues from Captain Cook State Park to the Gray Cliffs subdivision that Kenai Peninsula Borough platted in the early 1980s; this trail is generally used for access by all terrain vehicles and snow machines. With respect to future roads, the "Kenai Spur Highway Extension Project" (or North Road Extension Project), has been in the conceptual and design stage for many years. If built, the road will begin where the existing paved road ends in Captain Cook State Park at (MP 38.42) and will extend through the contiguous Kenai Peninsula Borough property, a distance of approximately 26 miles.

**Recreation and Tourism.** Approximately 500,000 people visit the Kenai Peninsula every year. For the past 20 years, tourism has been one of the fastest growing industries in the Borough; however, as a result of poor national economic conditions, tourism has been declining since its peak in 2007. Nikiski tourism remains predominantly dormant, and the provisions and services to support leisure travel have disappeared over the last 20 years. The CCSRA has experienced steadily increasing recreational use.

With an uptick in the national economy, an increase in tourism and recreational activities is reasonably foreseeable in the future.

**Cumulative Impacts to Environment.** The five major categories of cumulative impacts that could potentially occur from the Project are: air quality and emissions, vegetation and wetlands, access to previously undisturbed areas, wildlife, and additional oil and gas exploration and development. NordAq also reviewed the cumulative impacts to other resources, including as soils and groundwater, hydrology and water quality, fisheries, local economy, cultural resources, threatened and endangered species, visual resources, and subsistence but they are expected to be de minimis.

Air emissions in the area include emissions from existing oil and gas fields in the area, from heating of residential homes, and from vehicles on local roads. The Project would add to the air emissions in the area, particularly during construction and drilling. However, NordAq's air emissions would be localized and, in combination with other existing actions and RFFAs, would be minimal.

Impacts to vegetation and wetlands in the area are both natural and manmade and include a spruce bark beetle infestation in the 1990s, wildfires, increased roads and transportation facilities, and other oil and gas developments that result in logging and clearing for roads, pipelines, and pads. The Project would result in the loss or disturbance of approximately 50.3 acres of vegetation, including 11.1 acres of wetlands. NordAq's impacts on vegetation and wetlands would be localized, and would be restored upon the Project's decommissioning. Therefore, in combination with the impacts of the other existing actions and RFFAs, cumulative effects would be minimal.

With respect to wildlife, the project area is within the 1969 burn that provides quality habitats for high densities of moose and lynx, overlapping territories of two well documented wolf packs, and seasonal denning and feeding areas for black and brown bears. The new road construction associated with the Project could increase public access to previously undisturbed areas, which could in turn have impacts on wildlife resources through more contact and potential hunting, as well as increased recreational opportunities. Mitigation measures, including secured gate and fence at the start of the Project's road, would discourage access by snowmobilers and others and keep any impacts minimal. Wildlife impacts associated with the loss of habitat or the possible increase in vehicle collisions would result in only minimal cumulative effects when considered in combination with the impacts of existing actions and RFFAs.

If this Project is successful, it could stimulate additional oil and gas development activity on existing leases within the area of the KNWR. Any new exploration or development activity would be subject to state and federal permitting and fulfillment of the requirements of NEPA and, as part of that inquiry, cumulative impacts would be reconsidered. Even if additional exploration or development projects are approved, impacts are likely to be spatially and temporally distinct and therefore not have multiplicative effects.

***8. The degree to which the action may adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historical resources.***

Several sites within KNWR have been selected as historical or cemetery sites under Section 14(h) (1) of the Alaska Native Claims Settlement Act (ANCSA). Additionally, numerous historic cabins are also found on KNWR. Many of these sites and structures may meet the criteria for listing in the National Register of Historic Places; however, none of these sites and structures are within the project area. A thorough review of cultural resources in the project area was conducted [when], and this information was confirmed

by site-specific archeological clearance surveys conducted by Charles Mobley and Associates in September 2009 and again in August 2011 along the preferred road route and pad locations. These two surveys found nothing of significance. The Project would not adversely affect historic resources eligible or listed in the National Register of Historic Places. Therefore, consideration of the degree to which the Project may adversely affect historic resources does not render the potential impacts significant.

**9. *The degree to which the action may adversely affect an endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species Act of 1973.***

No species that are federally listed as threatened or endangered under the ESA or proposed for listing as threatened or endangered are known to occur within the project area. In addition, no areas designated as critical habitat or proposed for designation as critical habitat under the ESA are known to occur within the project area. Therefore, the Project would not adversely affect endangered or threatened species or designated critical habitat, which does not render the potential impacts significant.

**10. *Whether the action threatens a violation of Federal, State, or local law or requirements imposed for the protection of the environment.***

NordAq's proposed activities would comply with regulations and requirement of the USFWS, the Corps, and other state agencies. Table 2 (above) lists all of the permits and authorizations that NordAq would need to complete all aspects of the Project. NordAq considers any approval of its ROW to be a conditional approval in that commencement of its activities would not occur until it receives the necessary permits and authorizations. *The proposed development program would obtain all necessary federal and state permits and authorizations and follow permit stipulations to protect the environment. The survey program would not violate Federal, state, local, or tribal law.*

In conclusion, after considering the issues and evaluating the potential effects of the proposed activities described and the mitigation measures incorporated, an analysis of the 40 CFR 1508.27 significance factors indicates that there are no substantial questions regarding potentially significant impacts and no potentially significant impacts are expected to occur as a result of the Shadura Natural Gas Development Project.

## **BOX 19 HAZARDOUS SUBSTANCES**

### **Hazardous Substances and Non-hazardous Waste Management**

Non-hazardous solid waste would be classified, segregated, and labeled as general refuse, RCRA exempt or RCRA non-exempt. Afterwards, it would be stored in designated satellite accumulation, recycle accumulation, and universal waste accumulation areas, or appropriately labeled dumpsters.

All contractors working on the Project would be encouraged to use waste minimization and recycling practices. Whenever possible, environmental friendly products would be used to reduce waste. At the production pad during production, this would include using environmental friendly propylene glycol to help dehydrate wet gas for shipment and water-based corrosion inhibitor used to protect gathering lines.

The NordAq HSE compliance office would handle all waste management activities and be responsible for proper manifesting of waste for transport and off-site disposal. Management would include keeping the KNWR Refuge Manager informed on waste transport and off-site disposal.

Hazardous materials, or wastes, are defined for the proposed Project as: any substance, pollutant, or contaminant listed as hazardous under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, and/or any hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA) of 1976. The term does not include petroleum, including diesel oil (or any fraction thereof) that is not otherwise specifically listed or designated as a hazardous substance under CERCLA Section 101(14), 423 USC 9601(14); nor does the term include natural gas.

Table 3 summarizes anticipated types, handling, and disposition of hazardous materials during drilling and production activities. Hazardous materials used, produced, transported, or stored on or within the ROW or ROW facilities during construction and production would be limited to batteries and methanol (Table 3). Hazardous wastes during drilling would be limited batteries.

### **Non-hazardous Solid Wastes**

Table 3 also summarizes anticipated types, handling, and disposition of non-hazardous solid wastes expected to be generated during construction, drilling, and production.

<b>Table 3 Hazardous and Non-Hazardous Waste Management and Disposal</b>			
<b>Type</b>	<b>Source Activity</b>	<b>Handling</b>	<b>Management Notes</b>
<b>Hazardous Waste</b>			
Batteries	Construction, Drilling and Production	Separate and place in designated hazardous waste containers	Manage batteries through the KPB hazardous waste program
Methanol (freeze protect)	Construction and Production	Store in lined containment off-refuge during construction.  Store in 500-gallon AST on drill pad during production.	Recover fluids for freeze protection or other approved reuse
<b>Non-Hazardous Waste</b>			
Metal	Construction, Drilling and Production	Segregate, package, crush and palletize	Transport for off-refuge beneficial reuse (preferred) or disposal in Kenai Peninsula Borough (KPB) Central Landfill
Combustibles (paper, cardboard, wood)	Construction, Drilling and Production	Reduce volume by compacting	Package and transport to KPB Central Landfill
Oily Waste Rags, Spill Absorbent Pads	Construction, Drilling and Production	Reduce volume by first burning in "Smart Ash" incinerator offsite	Analyze incinerator bottom ash and provide results to KPB Central Landfill for approval prior to packaging and transport
Litter	Construction, Drilling and Production	Containerize (in sealed boxes or plastic garbage bags)	Collect litter, household garbage on an as-needed basis to maintain the site in an orderly condition. Transport off-refuge for disposal at the KPB Central Landfill
Propylene glycol	Production	Store in 50-gallon drums within secondary containment	Dispose in Class II underground or recycle for reuse
Corrosion Inhibitor (water based)	Production	Store	Transport offsite and dispose in approved Class I disposal well

**SUPPLEMENTAL 1 – PRIVATE CORPORATION**

- A. Articles of Incorporation**  
See Attached.
- B. Corporation Bylaws**  
See Attached.
- C. Certification from the State showing the corporation is in good standing and is entitled to operate within the State.**  
See Attached.
- D. Copy of Resolution authorizing filing**  
See Attached.
- E. Name and Address of each Shareholder**  
See Exhibit C, Box 12.
- F. Related Right of Way or Temporary Use Applications**  
See Exhibit C, Box 14 and attached.
- G. Federal Lands Identified by Agency**  
See Exhibit C, Box 7.

**Exhibit D**  
**Plan of Development**



**NORDAQ ENERGY, INC.  
SHADURA NATURAL GAS  
DEVELOPMENT PROJECT**

**Plan of Development**  
Revised March 2012

Prepared by:

NordAq Energy, Inc

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**Plan of Development  
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## Plan of Development Shadura Project

### INTRODUCTION

This Plan of Development for the Shadura Natural Gas Development Project (Project) is provided as supplemental information to the Standard Form 299 (SF299) Application to the U.S. Fish and Wildlife Service (USFWS) for a right-of-way (ROW) to access Cook Inlet Region, Inc. (CIRI) coal and mineral rights in the Kenai National Wildlife Refuge (KNWR). Information provided in the application is not repeated in this document.

#### 1) DESCRIPTION OF THE FACILITY

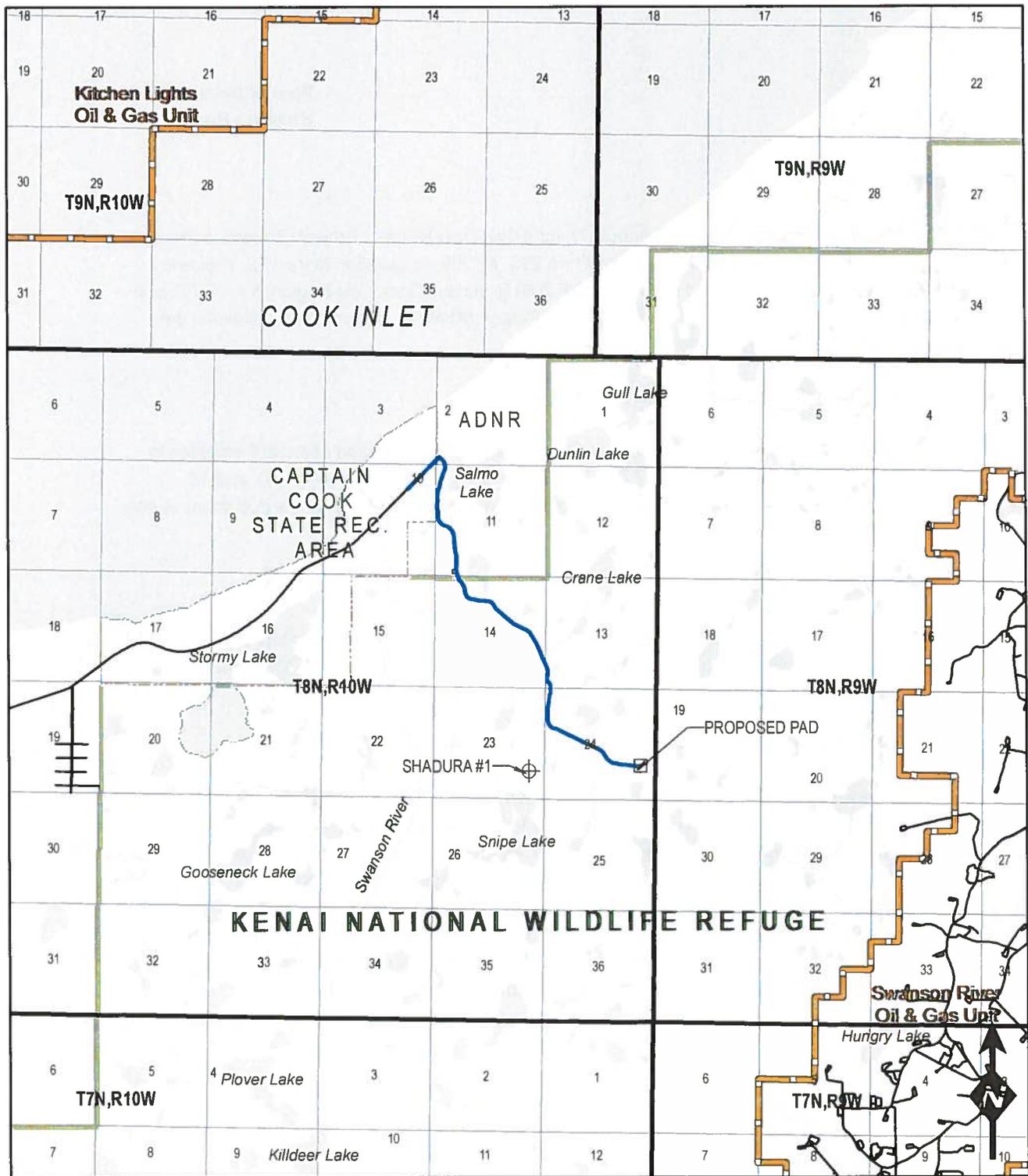
Information related to the project area, need for the project, and duration of the authorization is provided in the responses to Boxes 7 (Project Description), 8 (Map showing area), and 15 (Statement of Project Need) in the SF299 application and is not repeated in this document. A site location map is provided as **Figure 1**.

#### 2) DESIGN CRITERIA

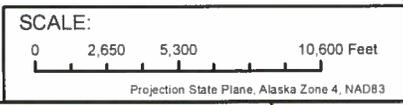
All information related to the design criteria and specifications for the service road, pads, natural gas gathering lines, power generation, and communications is provided in the SF299 Application and is not repeated in this document.

#### 3) CONSTRUCTION OF FACILITIES FOR DRILLING AND TESTING

Construction of the Project's facilities will involve two configurations of project facilities. First, NordAq will construct a narrow and thin gravel drilling and testing road to conduct delineation drilling and testing from a new well site as shown on Figure 1. Upon the successful installation and testing of the new well, NordAq will complete construction of the full proposed facility for production and operation, as described in Section 4. This construction will involve building out the service road and drilling pad to its full configuration, construction of the processing pad, meter pad, installation of production equipment, and placement of gathering lines, electric transmission line, and a fiber optic cable in a trench within the ROW. Table 1 summarizes the approximate schedule of activities.



	Shadura #1		Kenai National Wildlife Refuge
	Proposed Route		Captain Cook State Recreation Area
	Roads		
	Oil & Gas Unit Boundaries		
	Proposed Pad		



# PROJECT LOCATION

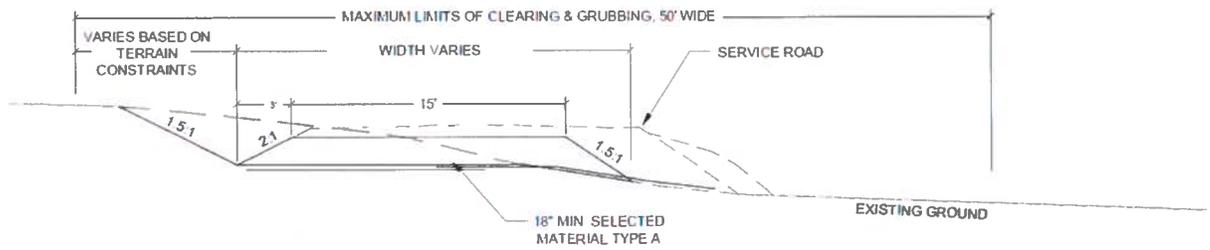
## PLAN OF DEVELOPMENT

FIGURE:  
**1**

**Plan of Development  
Shadura Project**

<b>Table 1 Proposed Testing Schedule</b>			
Task/Activity	Duration Days	Start	Complete
Engineering preparation, final permits	30	January 1, 2013	January 31, 2013
Place gravel and grade into 15-foot-wide 18-inch thick road ( <b>see Figure 2</b> ) from the end of the existing road on State of Alaska land to the drilling pad (see Figure 4). This will include two Gravel Storage and Loading Yards both located on State of Alaska land, ( <b>see Figure 3</b> ) one near the proposed meter pad and the second immediately north of the ADNR/KNWR boundary. The Gravel Storage and Loading Yards will become the metering and processing pad.	60	February 1, 2013	April 2, 2013
Drill and test on a 24-hour per day schedule with two crews of up to twelve workers. Evaluate testing results and verify the project can adequately recover the resource from the facilities as designed.	100	April 3, 2013	July 12, 2013
Demobilize testing equipment and evaluate testing results and make decision to continue with full development as proposed in SF299 application.	20	July 13, 2013	August 2, 2013

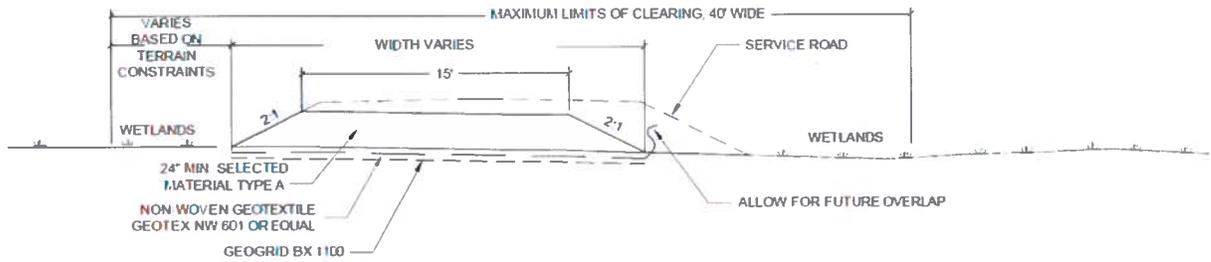
Details of the project construction methods are described in the following sections.



**NOTES**

1. MAXIMUM ROAD CLEARING WIDTH IS 50 FT. IN NEARLY LEVEL TERRAIN, REDUCE CLEARING WIDTH TO 40 FT.
2. UTILIZE MULCHING MACHINES FOR CLEARING AND GRUBBING WHERE FEASIBLE.
3. GRAVEL FILL SHALL BE PLACED IN NO GREATER THAN 8" LIFTS AND COMPACTED TO 95% OF MAXIMUM DENSITY.
4. TOP 4" SELECTED MATERIAL TYPE A SHALL BE COBBLE FREE (3" MINUS).
5. GRAVEL FILL SHALL BE UNDERLAIN WITH GEOTEXTILE, SEPARATION GRADE, WHERE SOFT UNDERLYING SOILS ARE ENCOUNTERED.
6. RESERVE TOPSOIL FOR STABILIZATION AND SEEDING ON CUT SLOPES.

**A TYPICAL TESTING ROAD SECTION - UPLANDS**  
SCALE: 1" = 10'



**NOTES**

1. GRAVEL FILL SHALL BE PLACED IN NO GREATER THAN 8" LIFTS AND COMPACTED TO 95% OF MAXIMUM DENSITY, AS DETERMINED BY AASHTO T 190, METHOD D.
2. TOP 4" SELECTED MATERIAL TYPE A SHALL BE COBBLE FREE (3" MINUS).
3. GRAVEL FILL SHALL BE UNDERLAIN WITH NON-WOVEN GEOTEXTILE, GEOTEX NW601 OR EQUAL.
4. IN WETLAND AREAS GEOGRID, BX 1100 OR EQUAL, MAY BE USED TO HELP STABILIZE GRAVEL FILL AS DETERMINED BY THE ENGINEER.

**B TYPICAL TESTING ROAD SECTION - WETLANDS**  
SCALE: 1" = 10'

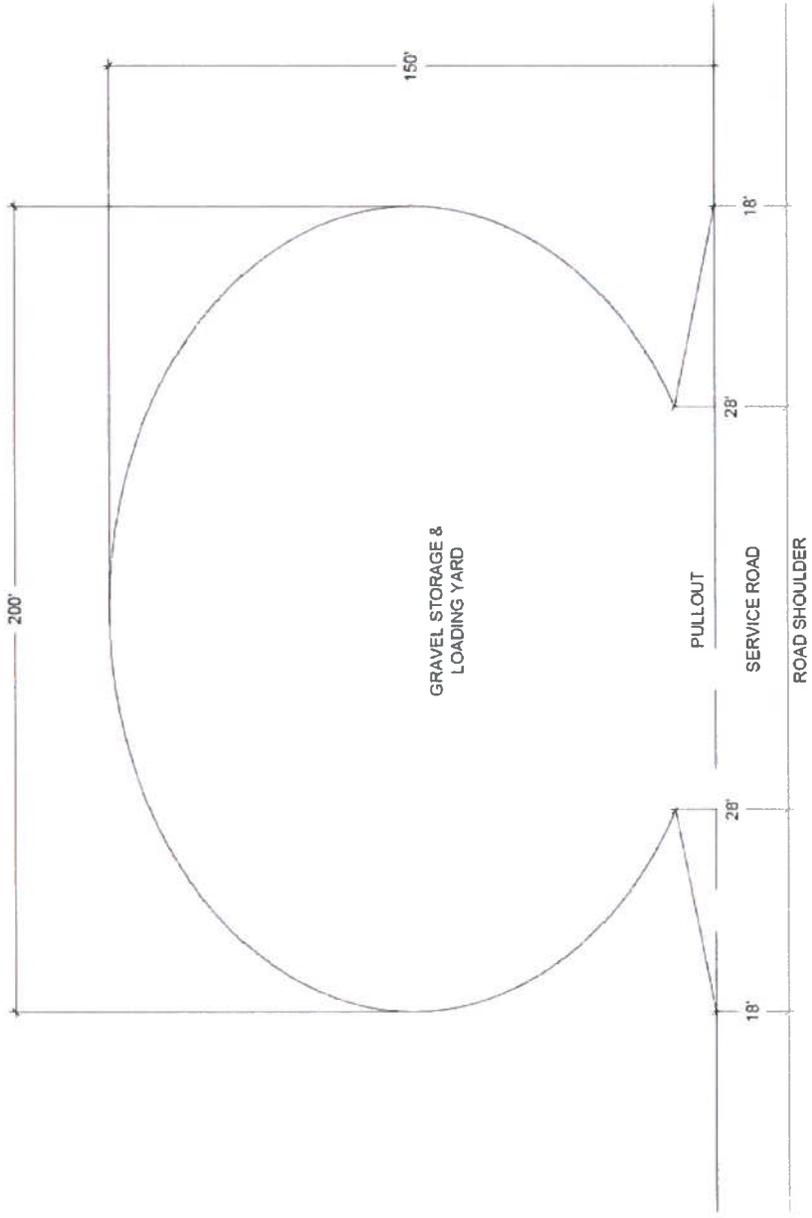


**TESTING ROAD TYPICAL SECTIONS**

PLAN OF DEVELOPMENT

FIGURE:

2



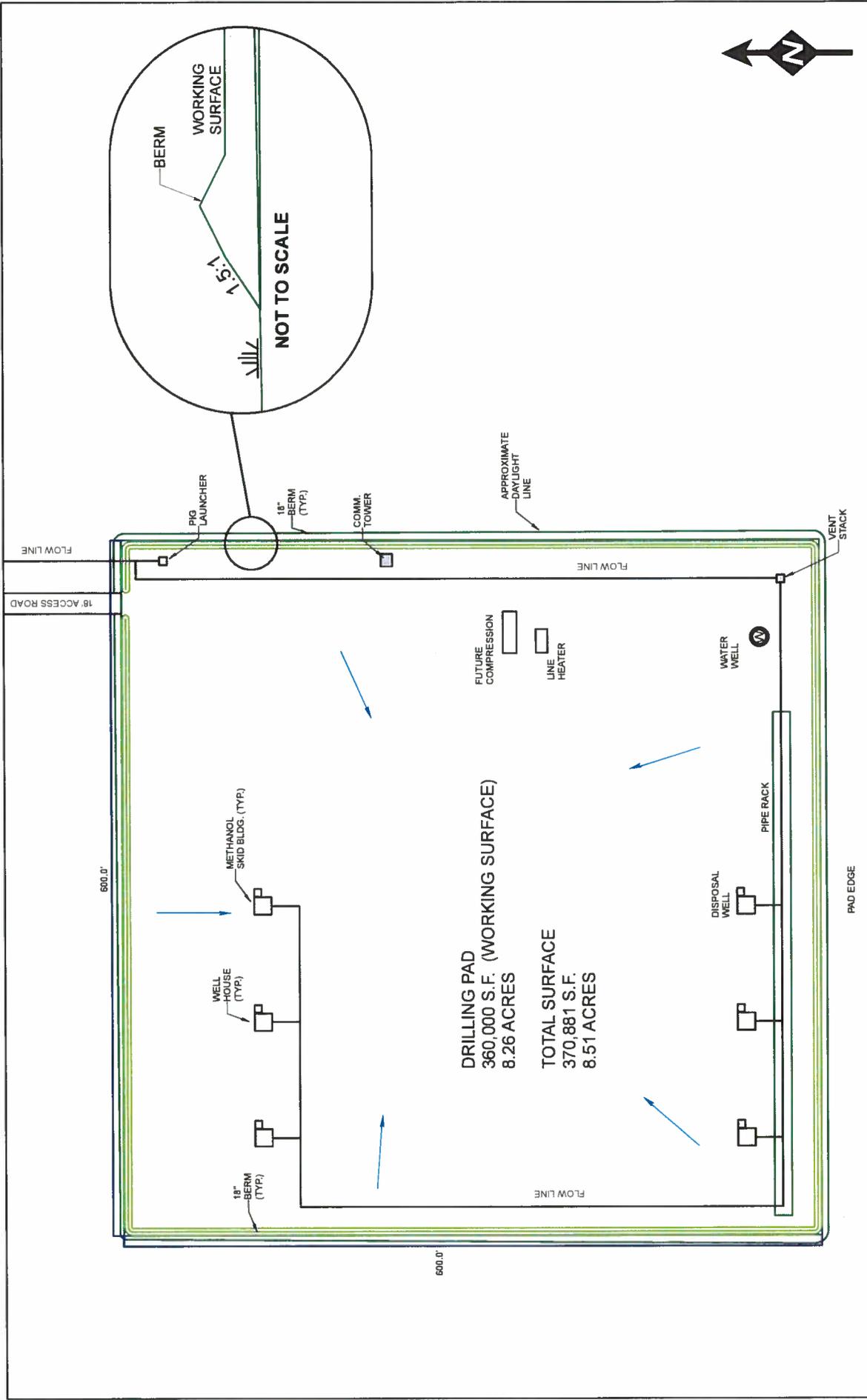
- NOTES:
1. GRAVEL HAULED TO YARD WITH TRACTOR TRAILER RIGS (SIDE DUMPS)
  2. MATERIAL STOCKPILED AND LOADED ONTO END DUMPS FOR CONSTRUCTION
  3. GRAVEL STORAGE & LOADING YARDS LOCATED AT MILE 0.4 & 1.4
  4. GRAVEL STORAGE & LOADING YARDS USED FOR BOTH THE TESTING & PRODUCTION ROAD CONFIGURATIONS.

**A GRAVEL STORAGE & LOADING YARD**

SCALE: 1" = 40'



<p>ALASKA Project Location</p>		<p><b>GRAVEL STORAGE &amp; LOADING</b></p> <p><b>PLAN OF DEVELOPMENT</b></p>	<p>FIGURE:</p> <p><b>3</b></p>
<p>Projection: State Plane, Alaska Zone 4, NAD83</p> <p>ARCADIS, NOR0000.mxd, 03/16/12, R00</p>			



<p>FIGURE: <b>4</b></p>	<p>ARCADIS KNOWLEDGE AND VISION FOR ALASKA</p>	<p>SCALE:</p> <p>0 25 50 100 Feet 0 10 20 40 M</p>	<p>Surface Water Flow Direction</p> <p>ALASKA Project location</p> <p>Projection State Plane, Alaska Zone 4, NAD83</p>
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**Plan of Development  
Shadura Project**

**3.1 Construction Preparation**

Upon issuance of the permits needed to begin construction, survey crews will stake the vegetation grubbing and clearing limit for the 15-foot-wide testing road. Within this construction ROW, only vegetation that is an impediment to the operation of equipment and construction will be cleared. No widespread clearing is expected to occur in wetlands or open meadows, only select clearing will occur in these areas.

Where tree felling is required, clearing angle points will be established within the ROW at one-quarter-mile intervals to limit line-of-sight distance along the ROW. This will help address concerns regarding wildlife crossing long straight-aways and could reduce the potential of unauthorized recreational access and use of the corridor by unauthorized persons.

Trees and brush having a stem diameter of 6 inches or less will be cleared with a HydroAxe. Woody debris will be left on site and scattered within the clearing limits. Trees having a diameter greater than 6 inches will be felled by hand or buncher, and stumps will be cut to within 6 inches of the ground surface. Felled trees will be moved to the edge of the clearing limits, and/or removed and disposed of in a manner that does not create a fire hazard. Brushy material may be crushed or mulched and used for restoration activities.

**3.2 Testing Road and Pad Construction**

Test road construction will begin on State lands and extend to the Shadura drilling pad. Altogether, construction of the test road and pad will involve approximately 250 trips per day – 200 trips by gravel trucks and 50 trips by light trucks and passenger vehicles. Table 2 summarizes the equipment that NordAq expects to use to construct the service road, drilling pad, and meter pad.

<i>• Table 2 Proposed Construction Equipment</i>			
<b>• Equipment</b>	<b>• Gross Weight</b>	<b>• Units</b>	<b>• Notes</b>
• Feller-Buncher 300	20 tons	1	Clearing in mature forest areas, large trees
• LGP Fecon Mulcher	15 Tons	2	Majority of clearing, track mounted
• Hydo-Ax [or HydroAxe]	16 tons	1	Light clearing, less than 6" dia.
• Excavator, 320	26 Tons	1	Excavation & embankment
Excavator, 345	50 Tons	1	Excavation & embankment
Dozer, D7 LGP	30 Tons	1	ROW preparation
Dozer, D5 LGP	11 Tons	1	Gravel spreading
Dump Trucks, End	15 Tons	3 - 6	Gravel hauling for road construction

**Plan of Development  
Shadura Project**

<b>• Table 2 Proposed Construction Equipment</b>			
<b>• Equipment</b>	<b>• Gross Weight</b>	<b>• Units</b>	<b>• Notes</b>
Dump Trucks, Side	45 Tons	8	Gravel hauling, pit to gravel yard
Wheel Loaders, 980	33 Tons	2	Gravel handling, pit & gravel yard
Motor Grader, 140	24 Tons	1	Construction & maintenance
Truck, Fuel	15 Tons	1	DOT Highway legal
Truck, Service	10 Tons	1	DOT Highway legal
Trucks, Light	4 Tons	6	Supervision, crew, surveyors

Road and pad materials will be placed in lifts and compacted. Culverts will be installed in wetland areas only as needed to maintain hydrologic conditions and prevent water from pooling up-gradient of the road. Where necessary, such as in wetlands, fill will be placed on geotextiles to increase sub-grade stability (**Figure 5**).

NordAq will implement the following typical mitigation measures to aid in controlling adverse impacts to the wetland environments. Silt fences will be erected around the immediate stream crossings to minimize potential sedimentation of these streams. Mulch generated by clearing activities will be placed strategically within the ROW to help contain sediment during construction. If necessary, NordAq will have a water truck with a spreader bar spread clean water on the construction site to control the generation of fugitive dust.

Temporary turnarounds will be spaced on quarter-mile intervals during construction to reduce the distance that dump trucks will need to backup. The temporary turnarounds will be 30-foot wide by 42-foot long and will only be constructed in naturally cleared areas. Temporary turnouts will be gravel placed on geofabric to protect the underlying vegetative mat. Gravel for the temporary turnouts will be removed upon completion of construction using a combination of excavator and vacuum truck.

**3.3 Stream Crossings for Roads**

No temporary bridges will be used for the test road. During construction of the 15-foot wide testing road, NordAq will install a single lane clear span bridge with gravel embankments (**Figure 6**) over both stream crossings. This bridge will allow for safe travel of heavy construction and testing equipment on both the testing road and the wider 18-foot wide service road without impacting the stream. Although construction will not require work in the streams, disturbance around the crossings may require additional restoration to eliminate or reduce the potential for sedimentation and degradation of water quality. Stream bank stabilization also may be required and will follow methods

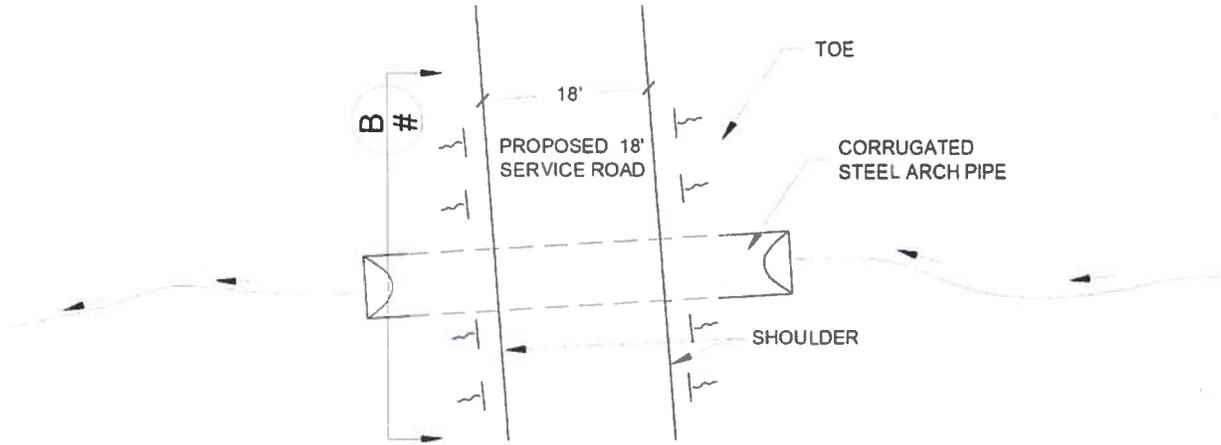
**Plan of Development  
Shadura Project**

outlined in *Streambank Revegetation and Protection: A Guide for Alaska*.<sup>1</sup> Detailed stream crossing plan designs will be provided to the USFWS and the Alaska Department of

Fish and Game (ADF&G) for review and approval before start of construction activities. The USFWS and ADF&G also will determine if stabilization is warranted by reviewing these plans prior to construction and/or onsite evaluation during construction.

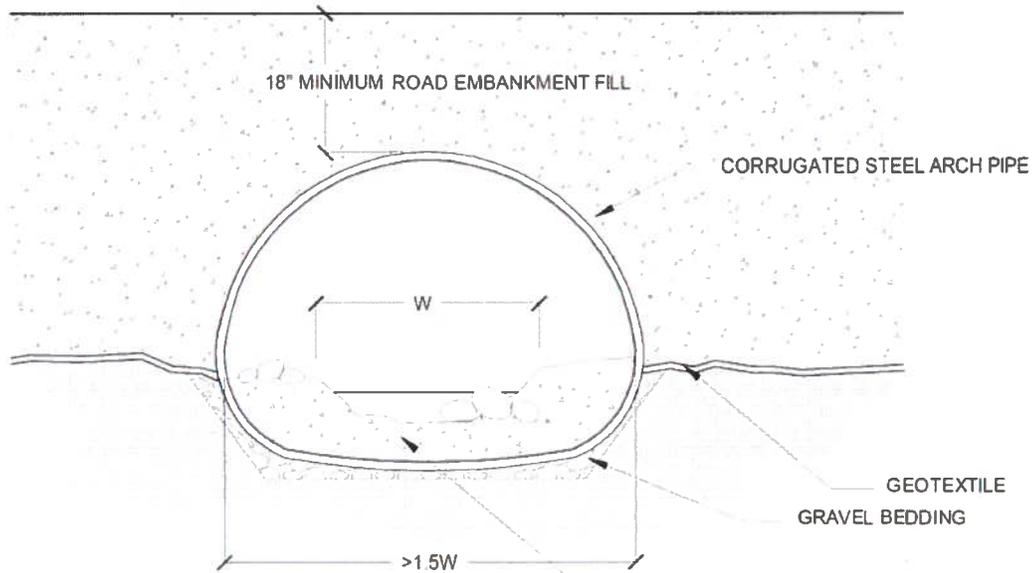
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<sup>1</sup> Alaska Department of Fish and Game, Division of Sport Fish, *Streambank Revegetation and Protection: A Guide for Alaska* (April 2005).



**A** CORRUGATED ARCH PIPE

SCALE: 1" = 20'



**NOTES:**

1. INSTALL PIPE 6" TO 12" BELOW BOTTOM OF NATURAL STREAM CHANNEL. MATCH STREAM GRADIENT.
2. PLACE CHANNEL BACKFILL MATERIAL IN PIPE. USE LOCAL GRAVELLY SAND WITH CLUSTERS OF COBBLES
3. USE PUMPED WATER BYPASS WITH APPROPRIATE SCREENED INTAKE AND ENERGY DISSIPATION AT DISCHARGE.

**B** CORRUGATED ARCH PIPE - (UP STREAM)

Scale 1" = 2'

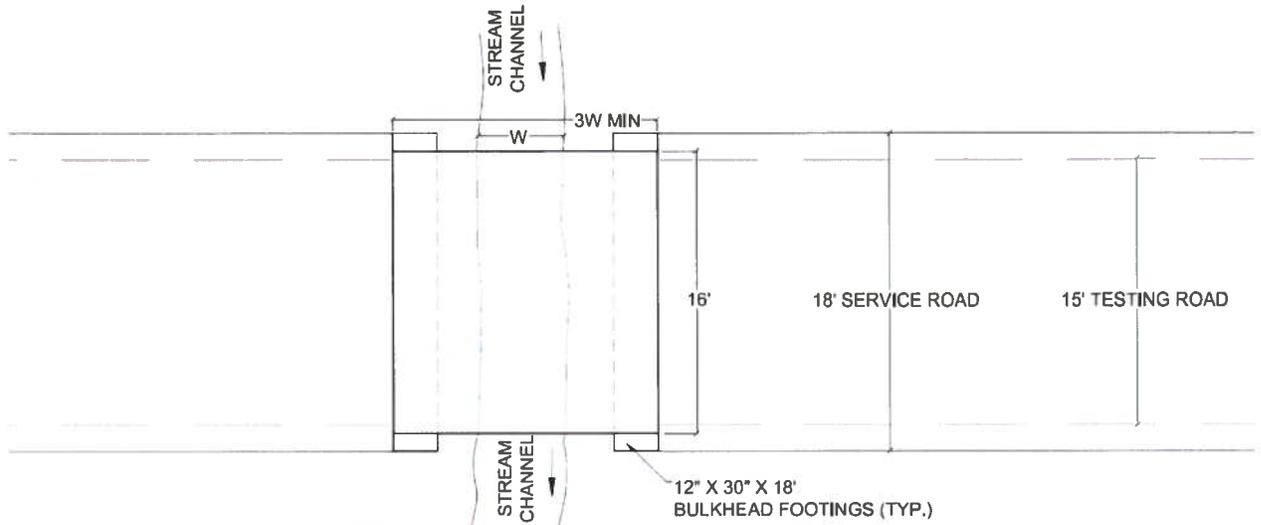


**SMALL STREAM CROSSING-  
CULVERT**

PLAN OF DEVELOPMENT

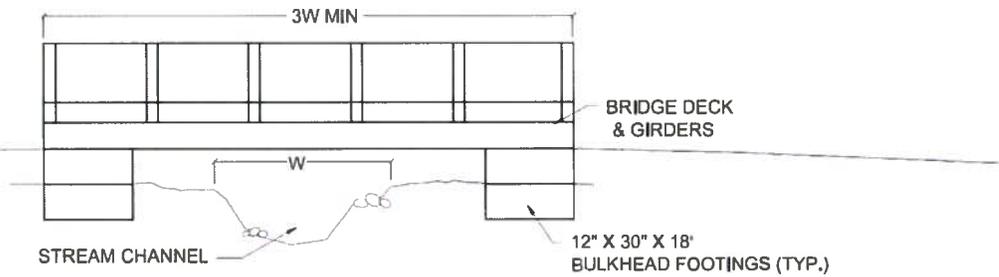
FIGURE:

**5**



- NOTES:  
 1. USE MATERIALS APPROVED BY ADFG FOR OVER STREAM CONSTRUCTION.  
 2. MAINTAIN CLEARANCE ABOVE STREAM SIDE VEGETATION.

**A** CLEAR SPAN BRIDGE  
 SCALE: 1" = 10'



- NOTE:  
 1. NO IN-WATER WORK OR FLOW RESTRICTION DURING CONSTRUCTION

**B** CLEAR SPAN BRIDGE  
 Scale 1" = 5'



**SINGLE LANE CLEAR SPAN BRIDGE PLAN VIEW**

PLAN OF DEVELOPMENT

FIGURE:  
**6**

**Plan of Development  
Shadura Project**

**4) CONSTRUCTION OF THE FACILITIES FOR OPERATIONS**

Upon completion of the testing program, NordAq will quickly move to complete the project and move into an operating mode. The construction will include expanding the test configuration to the facilities outlined in the SF299 Application. The approximate schedule of activities to move the project into production is provided in Table 3 below.

<b>Table 3 Proposed Construction and Production Schedule</b>			
Task/Activity	Duration Days	Start	Complete
Gravel haul & embankment upgrade to 18 feet width, preparation, final construction permits.	20	August 3, 2013	August 23, 2013
Construct the drilling pad to the final configuration and grade.	45	August 24, 2013	October 8, 2013
Drill water well and mobilize drill rig, refine base.	40	October 9, 2013	November 18, 2013
Drilling of Shadura wells #2 – #4, reservoir engineering, final engineering of gathering line, construct and test gathering line, complete tie in to CPANG	129	November 19, 2013	March 28, 2014
Production begins		March 29, 2014	
Drilling of Shadura wells #5 – #6	85	March 30, 2014	June 22, 2014

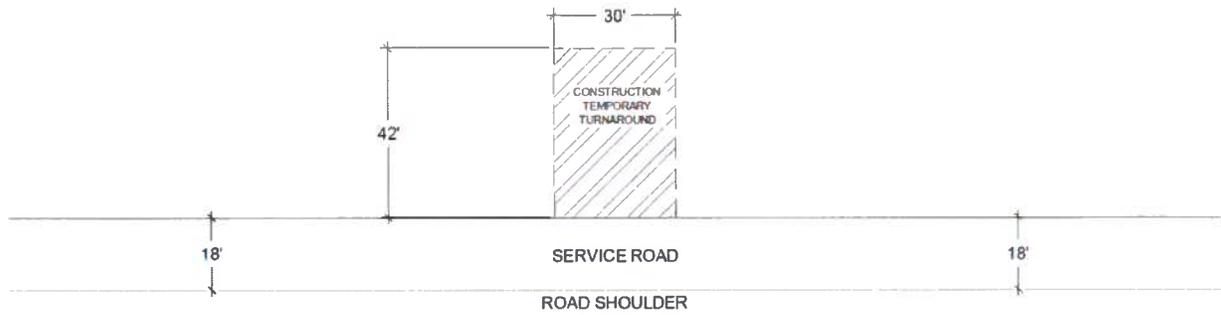
Details of the project construction methods are described in the following sections.

**4.1 Expanded Vegetation Clearing**

Upon completion of a successful evaluation, an expanded clearing limit will be staked to the 80-foot ROW. The same techniques described in Section 3.1 will be used for the final clearing (**Figure 7**). Clearing must be completed between 7/15 – 4/20, which is the best time for not interfering with ground nesting birds, mating and breeding activities of most species and is the time to less likely to interfere with migratory birds activities.

**4.2 Pad Expansion and Final Service Road Configuration**

Following successful evaluation, the testing road will be expanded to the 18-foot service road. The same techniques and equipment will be used to build out the testing facilities to the full configuration of the service road, meter pad and the drilling pad. Final grading of the pads includes higher elevation on the outer edges to collect storm water in a central area. The final drilling pad configuration is shown in Figure 4.

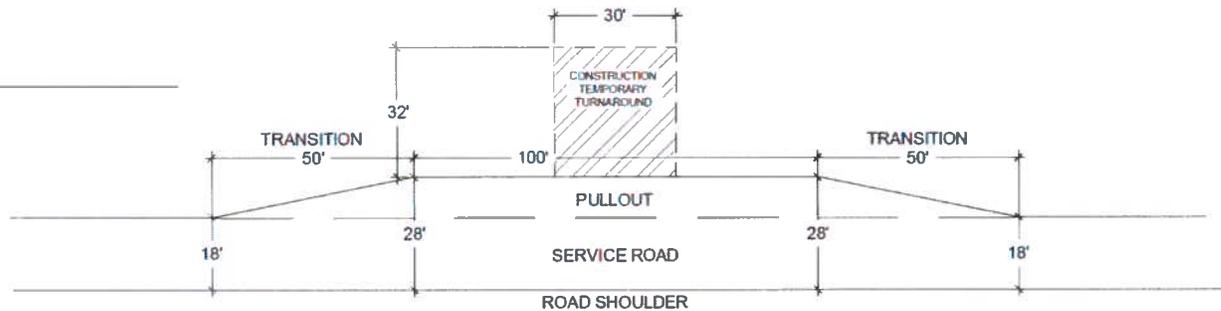


**NOTES**

1. FIELD FIT AT 400-500 FT. INTERVALS TO MINIMIZE CLEARING AND EXCAVATION
2. GRUB ONLY LARGE STUMPS.
3. PLACE FILL ON GEOTEXTILE FABRIC TO FACILITATE PICKUP AND REMEDIATION

**A TYPICAL CONSTRUCTION TURNAROUND - SERVICE ROAD**

SCALE: 1" = 40'



**NOTES**

1. PULLOUTS WILL BE INSTALLED AT 1/4 MILE INTERVALS. ADDITIONAL PULLOUTS WILL BE CONSTRUCTED WHERE HILLY TERRAIN AND LIMITED SITE DISTANCE ARE PREVALENT
2. TEMPORARY CONSTRUCTION TURNAROUNDS WILL BE BUILT AT EACH PULLOUT AND FIELD FIT TO MINIMIZE CLEARING
3. GRAVEL FILL SHALL BE PLACED IN NO GREATER THAN 12" LIFTS AND COMPACTED.
4. GRAVEL FILL SHALL BE UNDERLAIN WITH GEOTEXTILE TO FACILITATE TEMPORARY TURNAROUND REMOVAL.
5. PULLOUTS & CONSTRUCTION TEMPORARY TURNAROUNDS USED FOR BOTH TESTING CONFIGURATION & PRODUCTION CONFIGURATION

**B TYPICAL SERVICE ROAD PULLOUT**

SCALE: 1" = 40'



**TYPICAL SERVICE ROAD  
TURNAROUND & PULLOUT**

PLAN OF DEVELOPMENT

FIGURE:  
**7**

## Plan of Development Shadura Project

### 4.3 Gathering Lines

Gathering lines and the fiber optic cable will be buried adjacent to the service road within the ROW and as close to the toe of the roadbed as practicable. Gathering line lay down equipment will operate from the road surface wherever possible to minimize the area disturbed during construction.

#### 4.3.1 Trench Excavation and Installation

Construction will begin by excavating a trench about 6 feet wide and averaging 4 feet deep with a 0.5:1 side slope. If the frost line is deep enough, trenching will employ methods whereby frozen blocks of frost susceptible soil up to four-feet thick are removed and stacked for reuse in the same locations. Alternately, in thawed ground, the vegetative mat and organic soils will be removed and stockpiled separately from underlying non-organic silts, sands and gravels for use during revegetation activities.

Because the route traverses wetlands, excavation dewatering may be required. Sedimentation control during dewatering will include using straw bales and discharging water into natural depressions or into other sections of open gathering line trench. Wherever possible, water from excavations will be discharged to upland areas. If the dewatering site is not located near upland areas, water will be discharged into wetlands. In either instance, discharges will follow conditions on quality and quantity of discharge effluent as outlined in wastewater discharge permits issued by the regulatory agencies.

The gathering lines will be installed from the adjacent road surface wherever practicable, but some equipment may still need to operate in the area cleared for the gathering line prior to excavation. Trucks and side-booms will typically operate from the road surface.

#### 4.3.2 Stream Crossings

No work will be done in any on-site streams. All streams encountered will be crossed by installing single lane clear span bridges. During construction of the Testing Road, the gravel will be placed up to the stream crossing area, foundations will be installed and the bridge will be placed without impacting the stream. Installation of the gathering lines at the stream crossings will be accomplished by directionally drilling under the streams.

#### Wetlands

While working in wetland areas, to prevent the open trench from acting as a sump and draining wetlands, earth fill or sandbags will be used to dam the ditch at intervals and water will be removed and properly discharged while the trench is open. If wetland soils are not excessively saturated, construction will occur similar to conventional cross-country construction techniques employing the service road as much as possible.

## Plan of Development Shadura Project

Where wetland soils are saturated or inundated, the gathering lines possibly will be installed using the push-pull technique. This technique involves welding the gathering lines outside the wetland and stringing them into place using a backhoe. The prefabricated gathering lines will be installed by equipping them with buoys and pushing or pulling them on rollers along the water-filled trench. Once the gathering lines have been floated into the trench, the buoys will be removed allowing them to sink to the bottom. Gathering lines installed in wetlands will typically be fitted with buoyancy control measures.

For those wetland areas that have the potential to block surface water transfer passage within wetlands, one of the two methods described below will be implemented:

*Open-cut Method.* Open cut is the most common crossing method used and is accomplished by excavating a trench across the wetland and pulling or carrying the pipe into position. Trench excavation is accomplished using conventional excavation equipment, such as mechanical ditchers or excavators operating within roadbed ROW.

*Open Cut Isolation Method.* An isolated crossing technique will be used at locations if surface sheet flow conditions make open cut impractical. This method is similar to an open cut, but involves damming the water to permit excavation while maintaining a positive flow using pumps or dams and flumes. When the crossing is completed and the wetland stabilized with culverts installed, all dams will be removed, restoring surface flow over the wetland to its natural conditions.

### 4.3.3 Backfilling

The trench will be backfilled in the opposite order of excavation. First, frozen blocks will be replaced from where they were removed. If trenching was in thawed ground, underlying non-organic soils will be placed first, followed by organic soils, and finally the vegetative mat on top. All non-organic soils will be placed in lifts of sufficient thickness to protect the gathering lines and then wheel compacted. By compressing the soils, this will help minimize the possibility that the backfilled trench will act as a subsurface drain in wetland areas. All remaining soil will be placed in the trench and mounded to reduce subsidence that occurs in disturbed soil with time. The vegetative mat contains indigenous seeds and plants that will assist with the re-establishment of native vegetation and provide for a diversity of vegetation types. Routinely, NordAq will replace vegetative material and underlying soils from wetlands back into wetlands and vegetative material and underlying soils from uplands back into uplands.

### 4.4 Structure Installation

Production facilities may be constructed as self-contained modular units set on pile-type foundations, or as similar units placed on poured concrete foundations on the drilling pad. All buildings will be self-contained units (with raised kick plates across doorways, etc.) to reduce the potential for accidental spills to reach land or water. Efforts will be made to minimize the size of the production equipment, in keeping with the minimum practical pad size that has been selected for the

## Plan of Development Shadura Project

project. Installation of production facilities will begin immediately after the drilling and meter pads are constructed and of suitable compaction to allow for placement of structures.

Figure 4 depicts the conceptual layout of equipment on the drilling pad. The final design of the pad and associated infrastructure will take into consideration feasibility, safety, and minimal disturbance of the land. With existing storage at a minimum of 7 miles away and a one-lane road for access, items routinely needed for drilling will be stored on the pad.

The drilling pad provides the smallest footprint possible for safe operation of the equipment; allows adequate turnaround radius for the drill rig and large trucks; safe distances between wells and for stacking material; and sufficient distances between on-site facilities to safely maneuver other equipment. A smaller pad would only reduce impacts to the environment while not allowing for the safe operation of the production activities. NordAq plans to have up to 6 operating natural gas wells on this drilling pad, one water well, and one disposal well, therefore the size of the pad will remain as proposed.

A microwave relay tower will provide the backup communication system. A relay tower with a minimum height of 50 feet will be required to provide the line-of-sight needed to transmit microwave radio signals to/from the drilling pad. The antenna support will most likely consist of a treated telephone pole or an equivalent low profile Rohn® tower (or similar unit).

### 4.5 Construction Monitoring

NordAq will use local contractors familiar with the construction techniques and requirements for operating in and near the KNWR. Additionally, an assigned representative will be nominated to coordinate with the KNWR Manager with respect to all resource protection. The Health, Safety, and Environment (HSE) representative will report directly to NordAq's management.

### 4.6 Construction Restoration

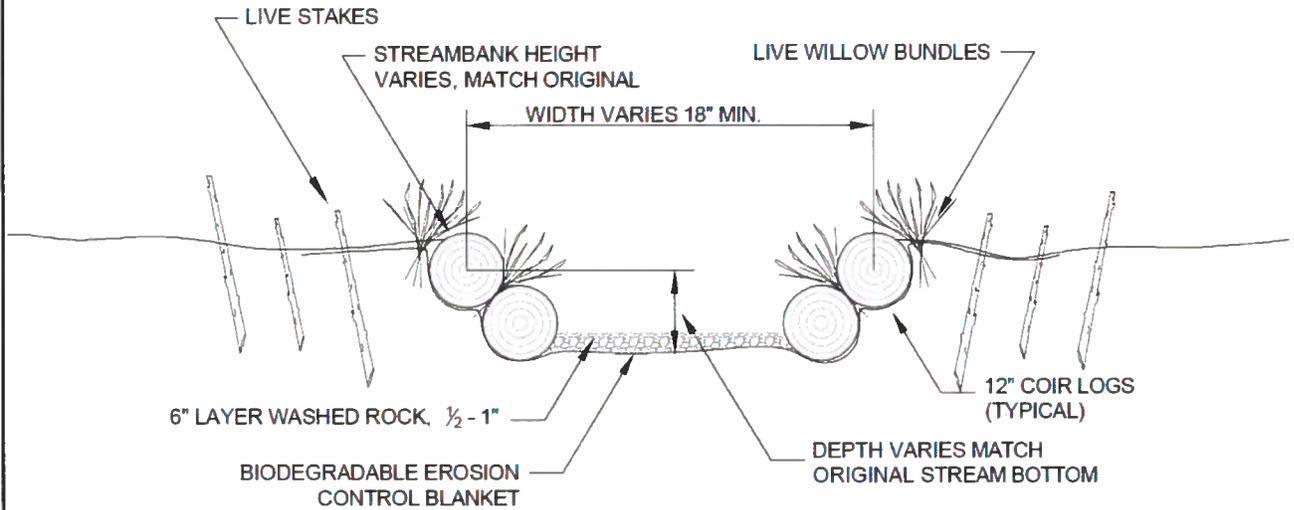
Construction of the roads, pads, and gathering lines will occur to the maximum extent possible during winter construction season of December through April. Winter construction allows opportunities to place temporary gravel facilities such as truck turnouts and then easily retrieve the gravel from a hard uniform surface. Areas where gravel will be retrieved after construction will be placed on top of a geofabric, which allows easy retrieval with a loader and vacuum truck.

Post-construction activities will include the stabilization of areas disturbed during construction to prevent erosion and promote revegetation by grading, reseeding, and erosion control. All construction equipment and supplies will be removed from the project location during construction demobilization activities. All facility areas, including roads and material sites, will be inspected to ensure that they are cleaned of all debris to the satisfaction of the USFWS and State representatives on their respective lands.

**Plan of Development  
Shadura Project**

Areas disturbed during road construction will be graded to blend with surrounding natural contours, and protected to prevent post-construction erosion. Temporary turnouts used during construction will either be incorporated into permanent turnouts or completely removed after road construction is completed.

USE AT END OF CULVERT PIPES AND OPEN-CUT PIPELINE INSTALLATIONS.



NOTES:

1. STREAM DEPTH AND WIDTH SHALL MATCH EXISTING NATURAL CHANNEL. MAINTAIN STREAM BOTTOM GRADIENT. MEET EXISTING ON BOTH UPSTREAM AND DOWNSTREAM END OF ROAD CROSSING.
2. PLACE BIODEGRADABLE EROSION CONTROL BLANKET UNDER STREAM BOTTOM AND OVER STREAM BANKS.
3. COIR LOGS SHALL BE STAKED OR ANCHORED IN PLACE. USE 1 TO 2 PER SIDE.
4. ENTIRE LENGTH OF DISTURBED STREAM BANK SHALL BE REBUILT AND VEGETATED ACCORDING TO TYPICAL SECTION.
5. LIVE STAKES SHALL BE WILLOW VARIETY NATIVE TO PROJECT VICINITY.
6. PLANT LIVE STAKES IN MEANDERING PATTERN. DO NOT PLANT IN ROWS.

**A** STREAM CHANNEL REHABILITATION - TYPICAL SECTION  
NOT TO SCALE



NORDAQ ENERGY INC.  
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**STREAM REHABILITATION**

PLAN OF DEVELOPMENT

FIGURE:

**8**

## Plan of Development Shadura Project

Material removed and stored during trench excavation will be used as backfill if feasible and organic soils will be used to facilitate successful revegetation. The material will be compacted and mounded on the trench alignment, and then covered with the vegetative mat to promote growth of indigenous plants. Compaction will reduce the potential for subsurface drainage; mounding will account for trench subsidence common to disturbed soil areas. In some areas however, soil will not be placed above the natural grade if the intent is to maintain pre-existing drainage patterns. Organic debris (dead falls, tree and brush stumps) removed during clearing and grubbing activities will be shredded to mulch and distributed evenly within the ROW.

### 5) DRILLING

A drill rig will be mobilized and wells will be drilled or re-entered using standard practices accepted in accordance with Alaska Oil and Gas Conservation Commission (AOGCC) requirements. A single drill rig will be used to drill all wells at the Shadura drilling pad. It will be diesel powered and driven either by electromotive diesel generators or direct drive, with approximately 2,000 horsepower (hp). Diesel will be transported to the drilling pad by truck and transferred into double wall aboveground storage tanks (ASTs) as described in Section 6.4.

The drilling program will begin when construction of the drilling pad is completed. At this time, NordAq will also drill a water well, a Class II disposal well, and five additional development wells from the same pad location.

#### 5.1 Water Well

A truck-mounted water well rig will drill a groundwater well to supply water for temporary living quarters; mixing of drilling fluids; and emergency response fire suppression. It is expected that drilling and completion will require approximately 30 days.

The water well will penetrate and withdraw groundwater from a confined aquifer. Drilling and groundwater withdrawal will follow State regulations and will include submitting a well log within 60 days of well completion.

#### 5.2 Class II Disposal Well

A drill rig will drill the Class II disposal well proposed for the disposal of drilling fluids generated during drilling of development wells and water produced during natural gas production. Fluid injection will be into intervals approved by both the AOGCC and the U.S. Environmental Protection Agency (EPA) Underground Injection Control (UIC) program. Injection intervals are expected to vary from 3,000 feet to 12,000 feet total vertical depth (TVD) in the Sterling, Beluga and Tyonek Formations. Drilling and completion are expected to take about 60 days. Drilling will typically involve most of the following general procedures:

- Excavate and line well cellar,

## Plan of Development Shadura Project

- Drive conductor casing to at depth of 80 to 100 feet,
- Install 20-mil oil-resistant geomembrane liner beneath the drill rig footprint and drape into the well cellar to collect all drilling-related fluids,
- Rig up the drill rig,
- Install diverter system and test,
- Drill to approximately 3,500 feet and run/cement surface casing,
- Install blowout prevention equipment (BOPE) and test,
- Drill to approximately 5,500 feet and run/cement intermediate casing,
- Drill to total depth (approximately 7,000 to 10,500 feet) and run/cement production casing,
- Run production tubing and packers,
- Perforate well, and
- Test and use for injection.

Casing completion and formation integrity testing will occur with every casing and/or tubing installed. Additionally, BOPE testing will take place throughout drilling operations following the requirements of AOGCC regulations.

### 5.3 Development Wells

Upon completing the Class II disposal well, five additional development wells will be drilled. Drilling and completion of each well will take up to 60 days. The operation will include most of the following general procedures or modified with AOGCC approval:

- Excavate and line well cellar;
- Drive conductor casing to between 80 feet and 100 feet;
- Install 20-mil oil-resistant geomembrane liner beneath the drill rig footprint, and drape into the well cellar to collect all drilling-related fluids;
- Rig up the drill rig;
- Install diverter system and test;
- Drill to approximately 3,500 feet and run/cement surface casing;
- Install blowout prevention equipment (BOPE) and test;
- Drill to approximately 10,500 feet and run/cement intermediate casing;
- Drill to total depth (approximately 15,000 feet) and run/cement production casing;
- Run production tubing and packers;
- Perforate well; and
- Test and put on production.

## **Plan of Development Shadura Project**

Casing completion and formation integrity testing will occur with every casing and/or tubing run. Additionally, BOPE testing will take place throughout drilling operations per AOGCC regulations.

### **5.4 Drilling Waste Disposal**

The project drilling program includes muds, cuttings, additives, and formational waters. The onsite NordAq representative will oversee drilling waste and fluids management activities and is responsible for proper manifesting for transport and off-site disposal of drill wastes.

### **5.5 Management of Drilling Fluids**

Drilling fluids are Resource Conservation and Recovery Act (RCRA) – exempt exploration fluids that consist of residual drilling muds, formational waters, and completion brines. At completion, drilling fluids will be circulated out of the hole for disposal following state and federal regulations. Incidental spills occurring during subsequent transfer operations will be contained by staging vacuum trucks in a bermed and lined cell adjacent to the drill rig, and using “duck ponds” below outlets during transfers.

On-site disposal will include annular injection into an on-site Class II disposal well in specific downhole intervals, approved by the AOGCC through a permit to drill process and the EPA through the UIC Program.

Possible off-refuge disposal includes injection into a third party Class II disposal well, or treatment followed by disposal at the KPB Central Landfill.

### **5.6 Management of Muds and Cuttings**

During drilling, the Company Man, toolpusher, driller, and qualified mud engineers will ensure that good oilfield practices are followed at all times. They will direct and maintain downhole mud properties and volumes and maintain the quantities of basic mud materials onsite. Drilling wastes (drill cuttings coated with residual fluids) will either be disposed onsite by annular injection or transferred off-refuge for temporary storage, treatment, and testing. Testing will help characterize the wastes in order to determine final disposal or reuse. Depending on characterization, drilling wastes will then be ground and injected (G&I) at an on-site Class II disposal well, an off-site third-party Class II disposal well, the KPB Central Landfill, or undergo beneficial reuse.

## **6) OPERATION AND MAINTENANCE OF THE FACILITY**

Activities that occur during well production include facilities operations, waste management, and gathering line monitoring. Related general production and processing operations at the drilling pad include:

- Maintaining production equipment and generators;

## Plan of Development Shadura Project

- Working over wells by using work over rigs plus electric line and slickline units;
- Injecting methanol as a hydrate point depressant and antifreeze;
- Launching pigs for gathering line maintenance and cleaning operations;
- Maintaining dehydration trains;
- Operating and maintaining the Class II disposal well; and
- Monitoring gas flow and production operations.

Related general operations at the meter pad include:

- Maintaining metering equipment and generators,
- Receiving pigs from gathering line maintenance and cleaning operations,
- Transferring dry gas via gathering lines to the nearby CPANG pipeline, and
- Monitoring gas flow and production operations.

The gathering lines will transport dry gas from the drilling pad to the meter pad. The anticipated maximum allowable operating pressure (MAOP) is expected to be about 1,480 psig. Related general operations procedures for the gathering lines will include:

- Monitoring gathering line operating pressure and flow rates by telemetry;
- Maintaining the gathering lines by using maintenance and cleaning pigs to remove sludge, debris, fluids, and other byproducts that precipitate out of the process stream;
- Testing for in-line corrosion by using corrosion coupons;
- Conducting a chemical-inhibition program (passive or impressed current cathodic protection also may be installed, depending on soil conditions found during gathering line construction);
- Performing visual and gas detection programs along the gathering line; and
- Establishing and performing maintenance and testing protocol.

### 6.1 Communications and Supervision

NordAq will monitor the operational status of production and the gathering lines 24 hours per day by an automated control system. Should abnormal operating conditions be detected, alarms will be sounded and should alarm limits be exceeded, an automated shut down at the production facilities and/or gathering lines will occur. At a minimum, alarms will be routed to the NordAq office in Nikiski and to the on-duty Production Officer.

### 6.2 Training

In order to facilitate a safe and environmentally compliant project site, all crewmembers will attend a project orientation and kickoff meeting and participate in daily tailgate meetings. A nominated onsite NordAq representative will monitor construction activities and coordinate activities with the KNWR Manager to protect the resources of the KNWR and approve field changes. The onsite NordAq

## Plan of Development Shadura Project

representative has the responsibility of training contractors of permit stipulations and tracking compliance. Training will also cover the contingency plans developed for the proposed Project (see Section 0). Additional specialized training will be provided to employees as needed, including such topics as traffic safety and permit compliance requirements.

### 6.3 Waste Management

#### 6.3.1 Solid Waste Disposal

Solid, non-burnable wastes will be deposited into large secured dumpsters approved for use on KNWR. These containers will be back-hauled to an off-site approved area for disposal facility by KPB waste management. No burning of any wastes will occur within the project area. Any food wastes that could attract wildlife will be stored in enclosed containers waiting periodic hauling, or hauled each day to an approved disposal center.

#### 6.3.2 Wastewater Disposal

Should the staging area need to discharge domestic wastewater, the contractor will receive necessary approvals from Alaska Department of Environmental Conservation (ADEC) for discharge of wastewater prior to commencement of activities.

### 6.4 Fuel Storage and Transfer

All fuel storage will be on State of Alaska land; fuel storage and transfers will comply with the applicable Alaska Department of Environmental regulations in 18 AAC 75.

All proposed Project contractors will have approved and current oil and fuel storage and Spill Prevention Control and Countermeasure (SPCC) plans as required by the EPA for the proposed Project. The SPCC plans will be developed before mobilization and will be available at all applicable locations. Contractors also will have written fuel transfer procedures plan that will be reviewed by the applicant prior to mobilization.

A minimum of two qualified personnel will always be present during fuel transfer operations. Spill response kits will be stationed throughout construction and operations in clearly marked containers. All other small fuel containers stored at the proposed Project operational sites will be stored within secondary containment.

- Fuel will not be stored on-refuge during construction; construction equipment will only use diesel fuel. Fueling will be from highway legal, commercial tanker trucks. In an effort to eliminate fuel spills, fueling will only occur at off-refuge staging areas, and within lined containment. Fueling will not occur along the road during construction. Additionally, fueling will be conducted using established fuel transfer procedures including placing secondary containment beneath fueling ports.

**Plan of Development  
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- Fuel storage during drilling will be limited to rig and generator day tanks, and on-refuge fuel storage will comply with the USFWS Region 7 Fuel Storage Policy. All drilling and service equipment will use diesel fuel and will be fueled as necessary by commercial tanker truck. Fueling will be conducted using established fuel transfer procedures and will include secondary containment beneath fueling ports.
- Aboveground storage tanks (ASTs) for methanol and produced water are steel-welded, double-walled tanks capable of holding 110 percent of their volume. Each AST will be located in bermed containment with liner and maintained per the operating procedures included in the SPCC plan. At a minimum, equipment will be installed per American Petroleum Industry (API) standards and will meet or exceed AOGCC, ADEC, and other applicable regulatory requirements.

**6.5 Water Requirements**

Table 4 provides water quantities calculated for use as part of the Alaska Department of Natural Resources (ADNR) Temporary Water Use Permits (TWUPs) during construction, drilling, and production.

<b>Table 4 Estimated Fresh Water Volumes</b>		
<b>Activity</b>	<b>Maximum Daily Volume</b>	<b>Estimated Total</b>
<b>Construction (one time only)</b>		
Temporary Turnouts	36,000 gallons	1,346,000 gallons
<b>Drilling (one time only)</b>		
Makeup Water	126,000 gallons	45,360,000 gallons
<b>Production (annual)</b>		
Non-potable Office Water	500 gallons	182,500 gallons

Water used during construction will be from a Salmo Lake that will require an ADNR TWUP. Appropriate testing of surface water sources will ensure that the water meets ADEC and ADNR water quality standards for discharge into the waters of the United States.

**6.6 Security and Safety**

**6.6.1 Security**

Facility security is always an important element to NordAq both during operation of the project to protect workers and the general public that use the lands for recreation. During construction, there will be a combination of manned and automatic security measures to control access to the testing

## Plan of Development Shadura Project

and service roads. A list of security control and safety measures that will be during the project is provided below.

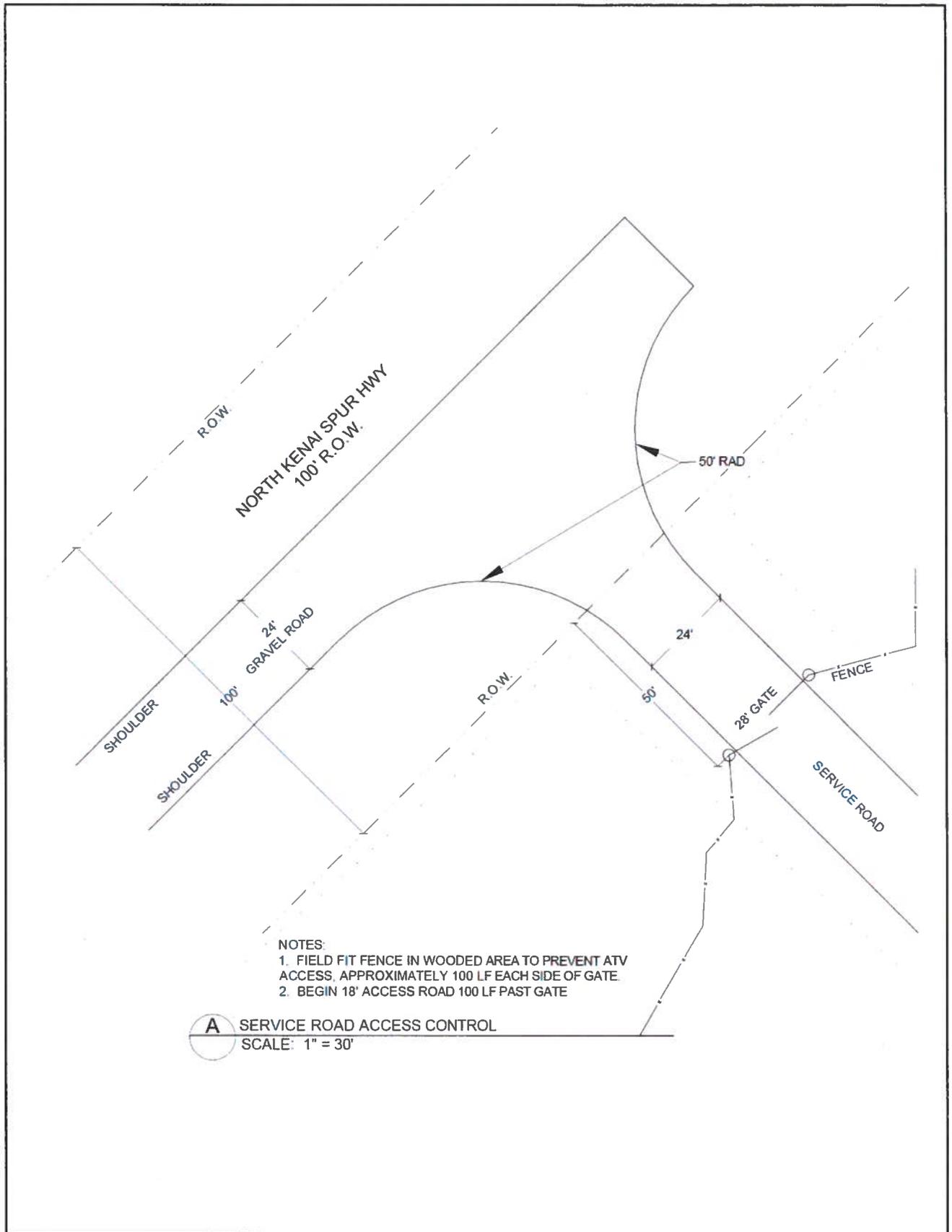
- Use of the testing and service roads by motorized vehicles will be controlled at all times. The control measures may include manned stations during times of high activity, or automatic systems such as card activated gates. Fencing and a gate at the service road access control point will be similar to that used at Beaver Creek and presented in **Figure 9**.
- Public exclusion zones will be marked with reflective delineator stakes and signs to notify the public of potential hazards.
- The access road will be marked with reflective delineator stakes at a spacing determined in future discussions with the KNWR.
- Notices to the public will be displayed at the start of the service road, at trail crossings, and at each pad. The notices will have applicant contact information for obtaining permission to access the project area.

### 6.6.2 Safety

During construction, all companies and contractors will follow the 2010 Alaska Safety Handbook (ASH 2010), State of Alaska Physical Agent Data Sheets (PADs), and individual safety plans.

During drilling operations, Petroleum Drilling and Production Standards, as outlined under 8 AAC 61.1180 will be followed. Additionally, the drilling program for the wells will be described in detail in an Application for Permit to Drill (APD) that will be filed with the AOGCC. In the APD, the drilling mud program, casing design, formation evaluation program, cementing programs, and other engineering information will be presented to ensure a safe drilling program. After rig up/rig/acceptance, each well will be spudded and drilled to the depth permitted by AOGCC.

The greatest potential for leaks or ruptures in a natural gas gathering line exists during production. Most ruptures are the result of heavy equipment that accidentally strikes a gas line while operating nearby. The materials used in the gathering lines will be designed and selected according to applicable standards to minimize the potential for a leak or rupture. Frequent identification markers along the gathering lines utility trench will help reduce the risk of accidental ruptures from excavating equipment. Additionally, a utility locate program will be implemented that will require sign-off of hot work permits, and NordAq will monitor the flow in the pipeline by either remote sensors or daily inspections of the flow meters, which will aid in reducing the probability of ruptures through prompt detection of leaks.



**SERVICE ROAD ACCESS CONTROL**

PLAN OF DEVELOPMENT

FIGURE:  
**9**

## **6.7 Contingency Plans**

Several contingency plans have been developed for the proposed Project; these will be used in orientation training and will be continuously updated.

### **6.7.1 Wildlife Awareness Interaction and Bear Avoidance Plan**

NordAq has a Wildlife Awareness Interaction and Bear Avoidance Plan for the Project. The plan includes a description of the area wildlife and seasonal activity. Project personnel will be instructed on how to avoid attracting, harassing, or injuring wildlife. Common human-wildlife interactions include unintentional attraction due to improper containment or disposal of anthropogenic food sources; deliberate feeding of wildlife; approaching sick, injured or apparently orphaned wildlife to give assistance; or unintentional injury of wildlife due to collisions with vehicles.

Improper garbage handling or foods left in pickup beds may attract ravens, red foxes, wolves, coyotes, weasels, or mink. If feeding of wildlife occurs, animals will likely change their behavior and willingly approach humans, which are harmful to wildlife and potentially exposes project personnel to wildlife diseases or aggression.

Project personnel will also be made aware of and sensitive to local trapping activities that focus on the harvest of beaver, muskrat, river otter, mink, coyote, lynx, and fox. Wintering moose use river valleys in the KNWR to find food and relief from deep snow, therefore personnel will be made aware of the potential for moose-vehicle collisions along the North Kenai Spur Highway and the service road.

Safe driving practices and speeds will be implemented. Project personnel will also be made aware of, and sensitive to, local winter subsistence harvest. A major focus of wildlife training will be on brown and black bears. Project personnel will become familiar with bear avoidance training provided in the plan along with instruction, on how to avoid attracting, harassing, or injuring bears. Plan objectives will include preventing bears from associating humans and drilling operations with food, preventing human-bear interactions, understanding controls used to prevent this interaction, protecting both workers and bears, and bear monitoring and reporting.

### **6.7.2 Spill Prevention Control and Countermeasure (SPCC) Plan**

An ADEC-approved Oil Discharge and Contingency Plan (ODPCP) will not be required due to drilling for natural gas and limited onsite fuel storage during production. All construction, drilling, and fuel contractors will have current, approved SPCC plans for refueling procedures. Additionally, well service and well testing companies will be required to hold SPCC plans for any double-walled ASTs or tanker trucks brought to the well site. Finally, all commercial sources used during fueling will have and follow written transfer procedures.

## **Plan of Development Shadura Project**

### **6.7.3 Production Operations and Emergency Plans**

Prior to production, NordAq will prepare a detailed production operations and maintenance plan that will be used to guide and train personnel. Additional orientation and constant training will be carried out to ensure safe operations are maintained, and the manual will be continuously updated to reflect production operations as they change.

Emergency Plans will be developed to cover all potential emergencies, including fires, employee injuries, and chemical releases, among others. The plans will include telephone numbers for all medical and emergency services and the contacts in event of emergencies. The plans will be posted at all the field facilities. All employees and subcontractors will be trained on the Emergency Plan when they are hired and refresher courses will be presented annually.

### **7) TERMINATION AND REHABILITATION**

Project planning will be for 30-years of production. Prior to final closure and abandonment, NordAq will develop a Restoration Plan with CIRI input, for approval by the KNWR Manager and State regulators. Site restoration will occur following cessation of production or abandonment of a specific project element or segment. The performance-based Restoration Plan will involve proven habitat restoration technology. The goal is restoration of disturbed areas to match surrounding habitats and to return the disturbed area to as near its original physical condition and biological productivity and diversity as practicable.

Sections of the service road and pads may be restored by removing gravel and culverts, grading to blend with natural contours, spreading overburden, and seeding in accordance with the approved Restoration Plan.

Upon cessation of production operations, all facilities will be removed from the pads and the gravel pads and roads removed (unless directed otherwise by the KNWR Manager), and buried natural gas gathering lines will be pigged to remove all liquids. The lines will then be abandoned in place to minimize additional disturbance and impacts to the vegetated ROW or removed if needed to satisfy final approval requirements. Wells will be plugged and abandoned (P&A) with well heads, tubing and casing cut at least 5 feet below natural grade. Finally, well cellars will be removed and backfilled.

Site assessments will be conducted along the gathering line route and on the pads to determine whether any previously unrecognized contamination has occurred and, if so, cleanup activities will be conducted in accordance with AOGCC requirements.

### **8) COMMUNITY ENGAGEMENT**

NordAq through its partnership with CIRI is familiar with the interest and sensitivities of activities in this area. They have conducted several opportunistic and casual discussions with local leaders and

## **Plan of Development Shadura Project**

local interest groups and will rely upon CIRI and others to continue these discussions during the application process. Casual discussions, newsletters and meetings have either occurred or are planned in the future with CIRI shareholders; Tyonek and Salomantof Native Corporations; Gray Cliffs subdivision residents; staff of the Kenai Watershed Forum, Kenai Peninsula Borough, and Kenai Peninsula Economic Development agency; local recreational user groups; and others. NordAq will coordinate and communicate with all these groups to keep them informed and to mitigate potential user conflicts when possible and practical.

Local hire and local contracting is a business model that NordAq used for the exploration of the Shadura project and will maintain through construction and operation of the facility. Nearly all positions for the Project are through contractors that are strongly encouraged to provide a local workforce on the Project.

### **9) PREHISTORIC, HISTORIC, AND ARCHEOLOGICAL SITES**

NordAq has consulted with a professional archeologist on the proposed project alignment and alternative routes. An initial assessment from a desk top study does not indicate any potential to disturb or disrupt any know prehistoric, historic, archeological, or cultural sites. A ground survey to conduct a detailed field inspection of the surveyed route was completed 9/26/2011 – 9/29/2011 by Chuck Mobley, a professional archeologist who also issued the appropriate report to the KNWR and State Historic Preservation Office. A portion of the route as modified in March 2012 was not included in the ground survey and will be conducted in the summer 2012.

### **10) PROJECT MITIGATION MEASURES**

This section summarizes the mitigation measures and environmental commitments incorporated into the project. Additional mitigation measures may be identified by permitting agencies and stipulated in permits.

- Construct a low profile and narrow, 15-foot testing road to enable access to the drilling pad;
- Clear brush for the narrowest possible corridor width to construct a 15-foot-wide testing road;
- Construct only those pullouts and turnarounds needed for the initial testing road and small drilling pad. These pullouts will have a 100-foot by 50-foot transition zones on each end. They will be constructed based on line-of-sight spacing approximately every quarter mile;
- A 100-foot by 200-foot pad will be constructed to conduct drilling and testing. Upon successful drilling and testing, the final pad configuration will be constructed;
- The project is designed to drill and test a single well prior to construction of the facilities necessary for production. In the remote scenario that the new well does not produce necessary results, facilities can be removed, relocated, or reduced to accommodate the change in conditions;
- NordAq will construct single lane clear span bridges to cross the identified streams;
- Conduct gas processing off refuge;

**Plan of Development  
Shadura Project**

- NordAq will adopt numerous measures to control sediment, including erecting silt fences around stream crossings to contain sediment, placing mulch from clearing activities within the ROW to contain sediment during construction, and using straw bales when conducting excavation watering when the ROW traverses wetlands;
- NordAq will use continuous gravel berms around pad perimeters to contain water and any possible spills, and grade pads to direct surface runoff to collection and analysis sumps;
- NordAq will adopt numerous measures to minimize air impacts associated with construction and operation activities, including:
  - (i) Power generation off refuge using natural gas powered equipment instead of diesel-powered equipment when feasible, to minimize combustion related emissions (including greenhouse gases [GHG]),
  - (ii) Operating all equipment in accordance with manufacturer's recommendations to minimize emissions including GHG, and
  - (iii) using modern, well-maintained machinery and vehicles meeting applicable emission performance standards to minimize construction-related emissions including GHG;
- NordAq will adopt measures to reduce visual impacts, including using sweeping zigzags in forest areas and sweeping curves in wetland areas to avoid a linear path and help camouflage the route during operations, and burying the natural gas gathering lines and fiber optic cables.

**Exhibit E**  
**USACE Section 404 Application and Supporting Documents**





18. Nature of Activity (Description of project, include all features)

See attached supplemental information.

19. Project Purpose (Describe the reason or purpose of the project, see instructions)

See attached supplemental information.

**USE BLOCKS 20-23 IF DREDGED AND/OR FILL MATERIAL IS TO BE DISCHARGED**

20. Reason(s) for Discharge

See attached supplemental information.

21. Type(s) of Material Being Discharged and the Amount of Each Type in Cubic Yards:

Type	Type	Type
Amount in Cubic Yards	Amount in Cubic Yards	Amount in Cubic Yards
See attached supplemental information.	See attached supplemental information.	See attached supplemental information.

22. Surface Area in Acres of Wetlands or Other Waters Filled (see instructions)

Acres See attached supplemental information.

Or

Liner Feet See attached supplemental information.

23. Description of Avoidance, Minimization, and Compensation (see instructions)

See attached supplemental information.

24. Is Any Portion of the Work Already Complete? Yes  No  IF YES, DESCRIBE THE COMPLETED WORK

25. Addresses of Adjoining Property Owners, Lessees, Etc., Whose Property Adjoins the Waterbody (if more than can be entered here, please attach a supplemental list).

Address - See attached supplemental information.

City -

State - Alaska

Zip -

26. List of Other Certifications or Approvals/Denials Received from other Federal, State, or Local Agencies for Work Described in This Application.

AGENCY	TYPE APPROVAL*	IDENTIFICATION NUMBER	DATE APPLIED	DATE APPROVED	DATE DENIED
See attached supplemental information.					

\* Would include but is not restricted to zoning, building, and flood plain permits

27. Application is hereby made for a permit or permits to authorize the work described in this application. I certify that the information in this application is complete and accurate. I further certify that I possess the authority to undertake the work described herein or am acting as the duly authorized agent of the applicant.

03/19/2012

\_\_\_\_\_  
SIGNATURE OF APPLICANT

\_\_\_\_\_  
DATE

\_\_\_\_\_  
SIGNATURE OF AGENT

\_\_\_\_\_  
DATE

The application must be signed by the person who desires to undertake the proposed activity (applicant) or it may be signed by a duly authorized agent if the statement in block 11 has been filled out and signed.

18 U.S.C. Section 1001 provides that: Whoever, in any manner within the jurisdiction of any department or agency of the United States knowingly and willfully falsifies, conceals, or covers up any trick, scheme, or disguises a material fact or makes any false, fictitious or fraudulent statements or representations or makes or uses any false writing or document knowing same to contain any false, fictitious or fraudulent statements or entry, shall be fined not more than \$10,000 or imprisoned not more than five years or both.

Provided below is supplemental information for the attached Section 404 permit application for the Shadura development project on State of Alaska and Kenai National Wildlife Refuge lands. Please note that the majority of the route is similar to a previous application submitted on September 1, 2011 and was based on fieldwork conducted during the summer of 2011. Portions of this new application have not been verified to field surveys and cannot be until spring 2012. The wetlands for those portions without field data were delineated, for the purpose of this application, through high-resolution aerial photography. The attached Figure 1 delineates the areas where wetlands were based on aerial photography alone.

### **Block 13**

Salmo Lake, Lower Swanson Creek Watershed, and Island Lake – Frontal Cook Inlet Watershed.

### **Block 15 Location of Project**

Please see the attached **Figure 1** for a map depicting the location of the project.

### **Block 16 Other Location Descriptions**

Section, Township and Range for proposed alternatives, including the preferred alternative Route C.

- S1 T7N R10W;
- S6 T7N R9W;
- S5 T7N R9W;
- S19 T8N R9W;
- S20 T8N R9W;
- S21 T8N R9W;
- S28 T8N R9W;
- S2 T8N R10W;
- S3 T8N R10W;
- S10 T8N R10W;
- S11 T8N R10W;
- S12 T8 R10W;
- S13 T8N R10W;
- S14 T8N R10W;
- S24 T8N R10W;
- S25 T8N R10W; and
- S36 T8N R10W.

### **Block 17 Directions to the Site**

Follow the North Kenai Spur Highway north past Nikiski to the end of the road at milepost 36 within the Captain Cook State Recreation Area ROW.

### **Block 18 Nature of Activity**

Time of year for construction is planned for the winter of 2012/2013.

**(a) Type of system or facility**

The proposed Shadura Natural Gas Development Project (Project) includes the infrastructure that is reasonably necessary to produce and transport known gas reserves from the Applicant's oil and gas lease in the Kenai National Wildlife Refuge (KNWR) to the ConocoPhillips' Alaska Natural Gas (CPANG) Nikiski pipeline which is located outside of the KNWR boundary. Presentation of information in the subsequent sections segregates facilities within KNWR and State land, which constitutes the entire Project.

NordAq will construct an 18-foot-wide single-lane service road that will connect the drilling pad (**Figure 2**) in the KNWR to the processing and meter pads on State lands (**Figure 3**). The width of the construction zone for the road will be approximately 40 feet, all within the proposed 80-foot ROW. The 4.3-mile-long service road will cross a variety of land ownerships. From the end of the North Kenai Spur Highway, it will follow an existing Kenai Peninsula Borough (KPB) ROW north then on Alaska Department of Natural Resources (ADNR) State land to a point past Salmo Lake. The road will then travel south through ADNR State lands and the KNWR to the drilling pad. The proposed service road would cross two streams. At each stream crossing, a single lane clear span bridge would be constructed to avoid direct stream impacts. No work would occur below ordinary high water and therefore no fill would be discharged to the streams and no culverts would be placed in the streams. Both streams crossings will involve horizontal, directional drilling, therefore a cross-section of the trench through a stream is not included.

The existing right-of-way in the Captain Cook State Recreation Area (CCSRA) is 30-feet wide. To support the Project, the existing road would be expanded. No streams are identified within the project area of the CCSRA and therefore there would be no direct impacts to streams within the CCSRA. The proposed road bisects a wetland complex in two locations and would result in impacts to wetlands.

**(b) Related structures and facilities**

The following calculations are based on the proposed Route C and not provided alternatives. Approximately 5 gravel service road turn-arounds and pullouts will need to be constructed. Temporary turnarounds will be spaced on quarter mile intervals to reduce the distance that gravel dump trucks will need to back up. The turn-arounds will be approximately 30 feet by 42 feet in configuration and will be placed only in naturally cleared areas. Geofabric will be placed down prior to gravel positioning to protect underlying vegetation. Temporary turn-arounds will not be constructed in wetland areas.

**a. Related structures and facilities in KNWR**

Reasonably necessary infrastructure to be located on Cook Inlet Region Inc. (CIRI) coal, oil, and gas estate leased to NordAq within the KNWR will include the following civil and mechanical structures and facilities:

- One approximately 600-foot by 600-foot gravel drilling pad (total surface is 8.51 acres) that can support six natural gas wells, gas processing and production equipment, one Class II disposal well, one water well, and one communication tower within the KNWR; and
- A 2.7-mile, 18-foot wide road that will enable the installation of a natural gas gathering lines and communication cables, and will tie to new and existing ROWs on adjacent State lands.

**b. Related structures and facilities on State of Alaska Land**

NordAq will include the following on State of Alaska Land:

- A 1.3-mile, 18-foot wide that will enable the construction of the all season gravel road, natural gas gathering line, and communication cable from KNWR to existing infrastructure;
- A 200-foot by 200-foot processing pad; and
- A 100-foot by 100-foot gravel meter pad (located entirely in an upland area) with one communication tower.

Location and alignment of the preferred Route (C) and proposed facilities is provided in **Figure 1**.

**(c) Physical specifications (length, width, grading, etc.)**

***Drilling and Production Pad on KNWR Land***

The proposed drilling pad will be an approximate 600-foot by 600-foot and will be constructed by placing 3-feet of gravel fill in wetland and 2.5-feet gravel in upland. This modified rectangular footprint will encompass a total of 8.51 acres. NordAq is working with the Kenai National Wildlife Refuge (KNWR) and is sensitive to the need for the size of the drilling pad. The following facilities will be constructed on the drilling pad:

- Six natural gas development wells;
- One prefabricated 500-gallon aboveground storage tank (AST) for storing methanol at each well (six total), with each tank including an in-line chemical pump for injecting the methanol into the associated flowline;
- One Class II disposal well;
- One water well;
- One well house allocated for each well (eight total) with a heat exchanger and line heater;
- Indirect line heaters for each well to facilitate good separation and prevent formation of hydrates;
- One dehydration unit comprised of glycol contactor/cooler/reboiler, heat exchanger, filter, and inline heater;
- One pipe rack area used to consolidate the gathering lines and direct them to different processes;
- One control room and microwave relay tower;
- Tool house; and
- Pig launcher and receiver facility.

***Processing Pad on State of Alaska Land***

A 200-foot by 200-foot processing pad will be constructed on approximately 3 feet of fill with a total footprint of 0.92 acres. The processing pad will be located on State of Alaska land immediately north of the boundary with KNWR. The following facilities will be placed on the Processing Pad:

- Two generators, a primary gas-fired generator and a backup diesel generator;
- One dehydration unit comprised of glycol contactor/cooler/reboiler, heat exchanger, filter, and inline heater;
- 500-gallon diesel fuel storage;
- One 500 barrel produced water holding tank; and
- Storage connex.

**Meter Pad on State of Alaska Land**

The 100-foot by 100-foot gravel meter pad will be constructed entirely in upland vegetation by placing about 2.5-feet of fill in a rectangular footprint of 0.3 acres. Facility equipment will be prefabricated off site as much as possible and transported to the drilling and production and meter pads by truck. Construction of facilities to support production will begin after the drilling and production and meter pads are constructed.

**Block 19 Project Purpose**

The purpose of NordAq's proposed Project is to bring new natural gas reserves into production to continue to meet the energy needs of the Cook Inlet region which currently produces more than 200 billion cubic feet of natural gas per year for consumption and export. More than one-half of Alaskans rely on Cook Inlet natural gas to generate electricity and to heat homes and businesses, and the demand is rising. This project will supplement the growing needs for demands on available Cook Inlet region natural gas.

The project will also allow CIRI to pursue economic benefits associated with these lands. CIRI owns the coal, oil, and gas estate in the project area as a result of agreements in the 1976 CIRI/U.S./State settlement. The lands were included in the settlement due to their likely resource values, and the 1976 CIRI/U.S./State settlement contemplated the proposed activities. Consistent with the intent of the 1976 settlement, CIRI leased the lands to NordAq for the purpose of realizing an economic benefit from the lands. Pursuing this project allows CIRI to fulfill its duty to its shareholders to proceed with the timely development of its coal, oil and gas estate located in the KNWR.

**Block 20 Reason(s) for Discharge**

Discharge materials are related to the construction of a gravel service road and production pad. There will not be excavation within the proposed road bed or drilling and production pad prior to gravel discharge, therefore, no excavated material will be disposed.

**Block 21 Type(s) of Material Being Discharged and Amount of Each Type in Cubic Yards**

The material discharged for the service road will impact wetlands on both ADNR and KNWR lands. Material for the drilling and production pad is for wetlands located entirely on KNWR land.

Type: Gravel

Amount in Cubic Yards:

- Service road; and
  - 9,800 cubic yards of gravel fill in wetlands (3-feet of gravel fill in wetlands)
  - 37,500 cubic yards of gravel fill in uplands (2.5-feet of gravel fill in uplands)
  - 47,300 total cubic yards of gravel fill in uplands and wetlands combined.
- Drilling Pad
  - No portion of the drilling pad will involve the disturbance of wetlands.
  - 40,600 cubic yards of gravel fill in uplands
- Processing Pad
  - No portion of the processing pad will involve the disturbance of wetlands.
  - 4,700 cubic yards of gravel fill in uplands

- Meter Pad
  - No portion of the meter pad will involve the disturbance of wetlands
  - 1,200 cubic yards of gravel fill in uplands

#### **Block 22 Surface Area in Acres of Wetland and Other Waters filled**

A total of 18.73 acres of wetland surface area disturbed.

#### **Block 23 Description of Avoidance, Minimization, and Compensation**

Minimizing and mitigating the impacts of oil and gas exploration and development on the KNWR is a high priority of the United States Fish and Wildlife Service (USFWS). From that perspective, a right-of-way (ROW) grant is sought from the USFWS which contains stipulations and conditions to ensure that the resource values and purposes of the KNWR and USACE are maintained.

Alternative Route C is NordAq's preferred route (see **Figure 1**). To the extent practicable, NordAq would avoid wetland impacts by adjusting the drilling and production pad or road locations into upland areas and implement mitigation measures to minimize the impacts to wetlands that do occur.

##### Avoidance:

Avoidance, minimization and mitigation are considered in the lease plan of operations. These various routes were considered and analyzed based on impacts to wetlands, impacts to uplands and technical feasibility and the viability of NordAq being able to hit its down-hole target location. Of the seven routes considered, NordAq applied for the only economically feasible route that allows for achieving project goals, the subsurface evaluation of hydrocarbon resource potential, and the minimization of wetland impacts (Route C).

- Route best traverses the upland/wetland fringes;
- Avoids the largest amount of wetland and forested habitats;
- Avoids the greatest potential for bear denning and fishing areas;
- Utilizes the greatest amount of the previously permitted ice road; and
- Uses single clear span bridges to cross the three recognized streams.

##### Minimization:

Where practicable, the route was aligned and designed to minimize unavoidable impacts to wetlands. NordAq has committed to not construct any of its turnarounds and pull outs within wetland areas. Additionally NordAq designed the position of the well pad location so that it would not impact any wetlands.

- Use earth fill or sand bags to fill in the open trench during construction;
- Remove water accumulated while the trench is open;
- Adopt buoyancy-control measures for gathering lines installed in wetlands;
- Use the push-pull technique to install gathering lines in saturated or inundated wetland soil areas;
- Service road will utilize existing ice road pathway whenever practicable;
- When practical, construction will occur during winter months to reduce wetland impacts; and
- When practical, vegetation will be cleared in the fall and early winter so it would not destroy bird nests with eggs or young or disturb denning animals during hibernation.

Compensation:

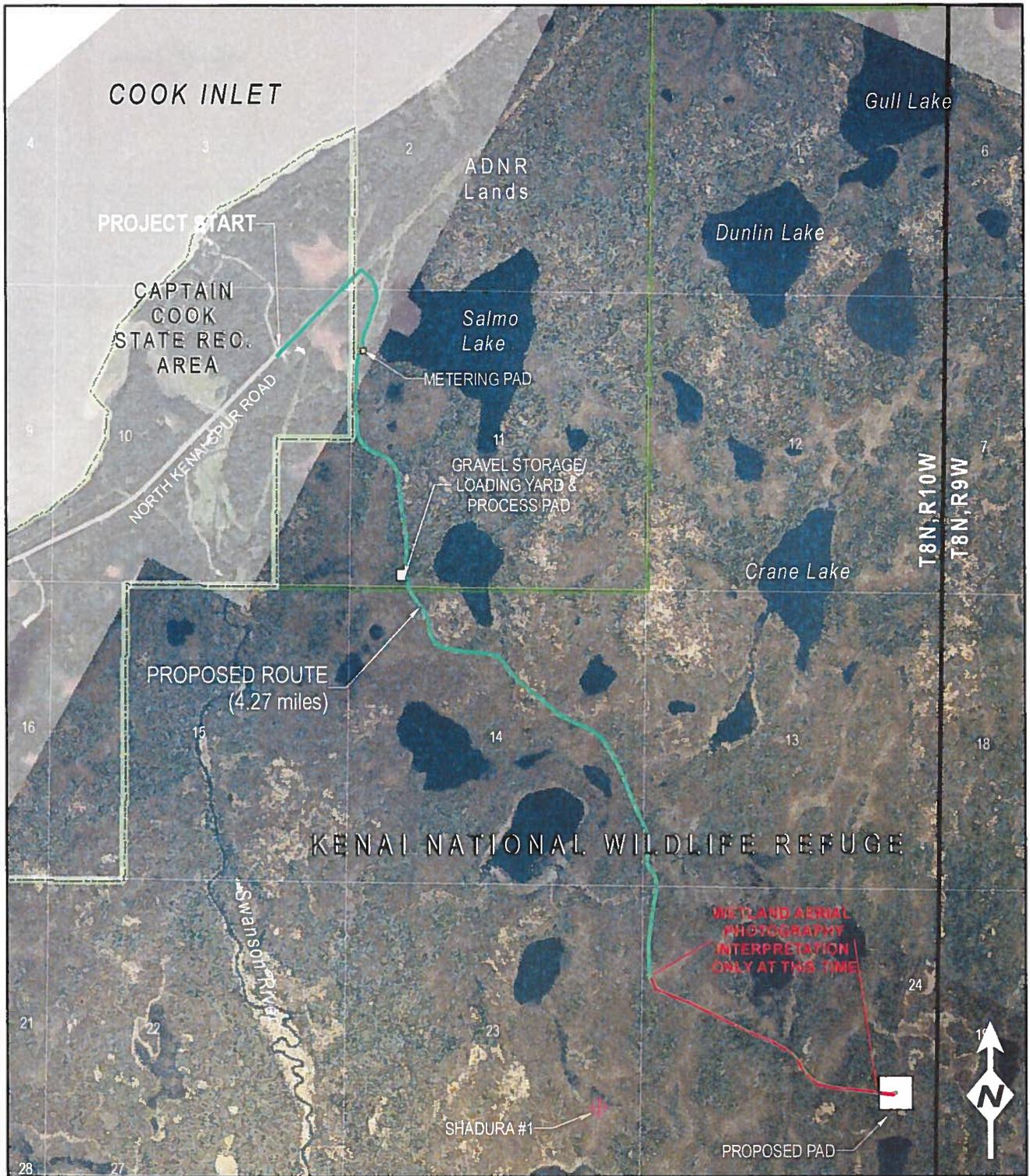
- Mitigation is proposed at a 2:1 ratio;

As compensation for unavoidable impacts to these wetlands NordAq will provide mitigation at a ratio of 2:1 acres. Utilizing the mitigation ratio would preserve wetlands through the In Lieu Fee (ILF) for Preservation. The rationale for the ratio is based on the functional value of the NordAq recognizes the value that wetlands provide to the environment, wildlife and human populations and is in communication and discussions with the ILF sponsor (The Conservation Fund). A Final Mitigation Plan will be submitted once the results of the exploratory well are evaluated.

**Block 25 Addresses of Adjoining Property Owners, Lessees, Etc., Whose Property Adjoins the Waterbody.**

Adjoining surface land ownership managed by:

1. Captain Cook State Recreation Area  
Kenai Area State Parks Office  
P.O. Box 1247  
Soldotna, AK 99669
2. Kenai National Wildlife Refuge  
Ski Hill Road, P.O. Box 2139 MS 519  
Soldotna, AK 99669-2139
3. U.S. Fish and Wildlife Service  
Division of Realty and Natural Resources  
1011 East Tudor Road MS-231  
Anchorage, AK 99503



Proposed Route	Metering Pad
Proposed Pad	<b>Administrative Boundaries</b>
Shadura #1	Kenai National Wildlife Refuge
Roads	Captain Cook State Recreation Area

SCALE:

Projection State Plane, Alaska Zone 4, NAD83



**PROPOSED ROUTE & PAD LOCATION**

SHADURA DEVELOPMENT PROJECT

FIGURE:  
**1**

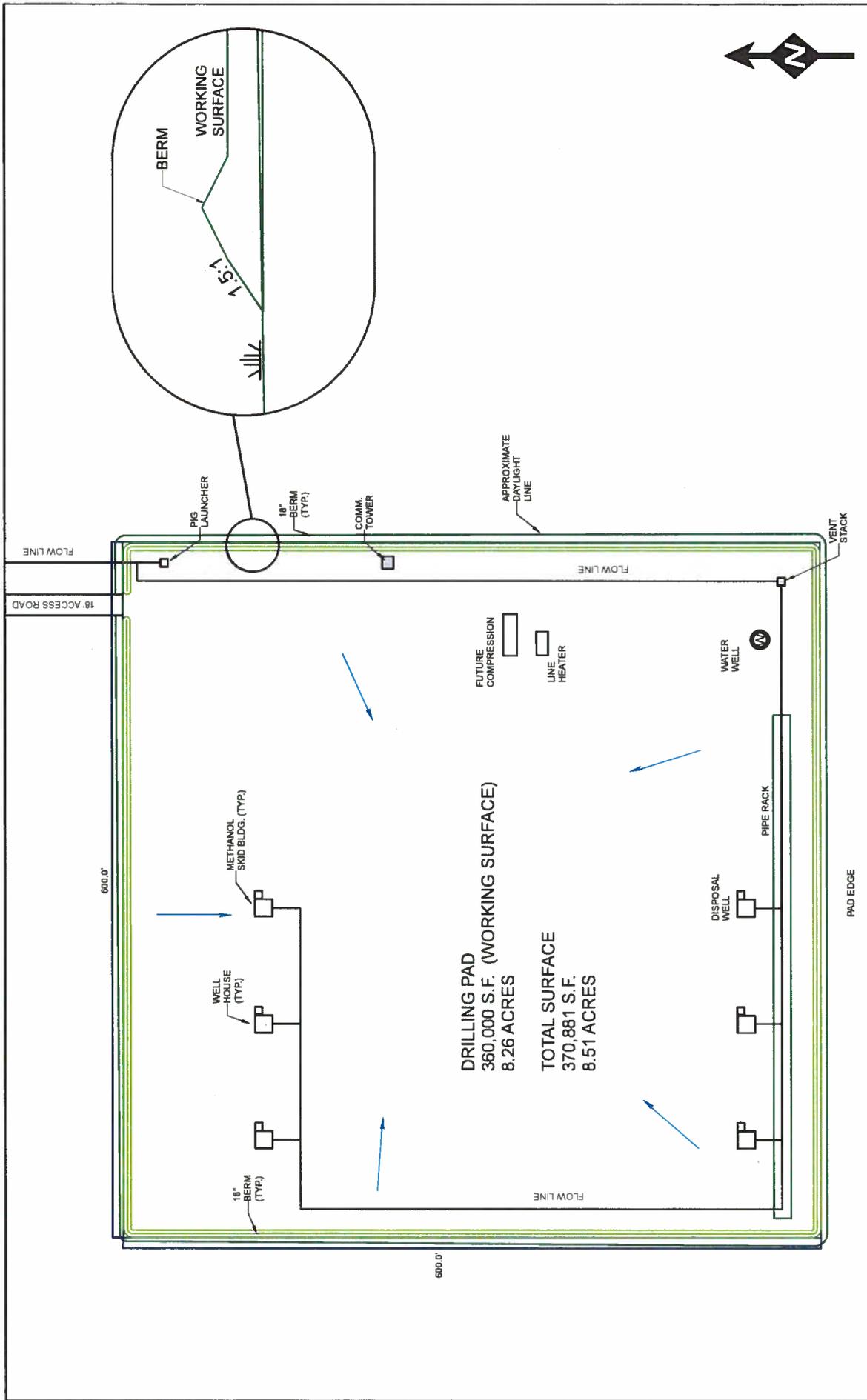
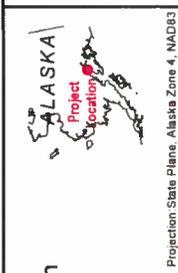
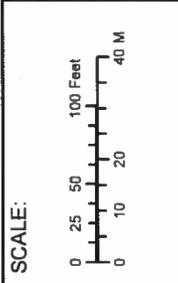
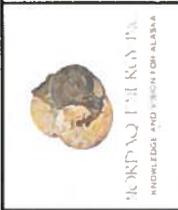


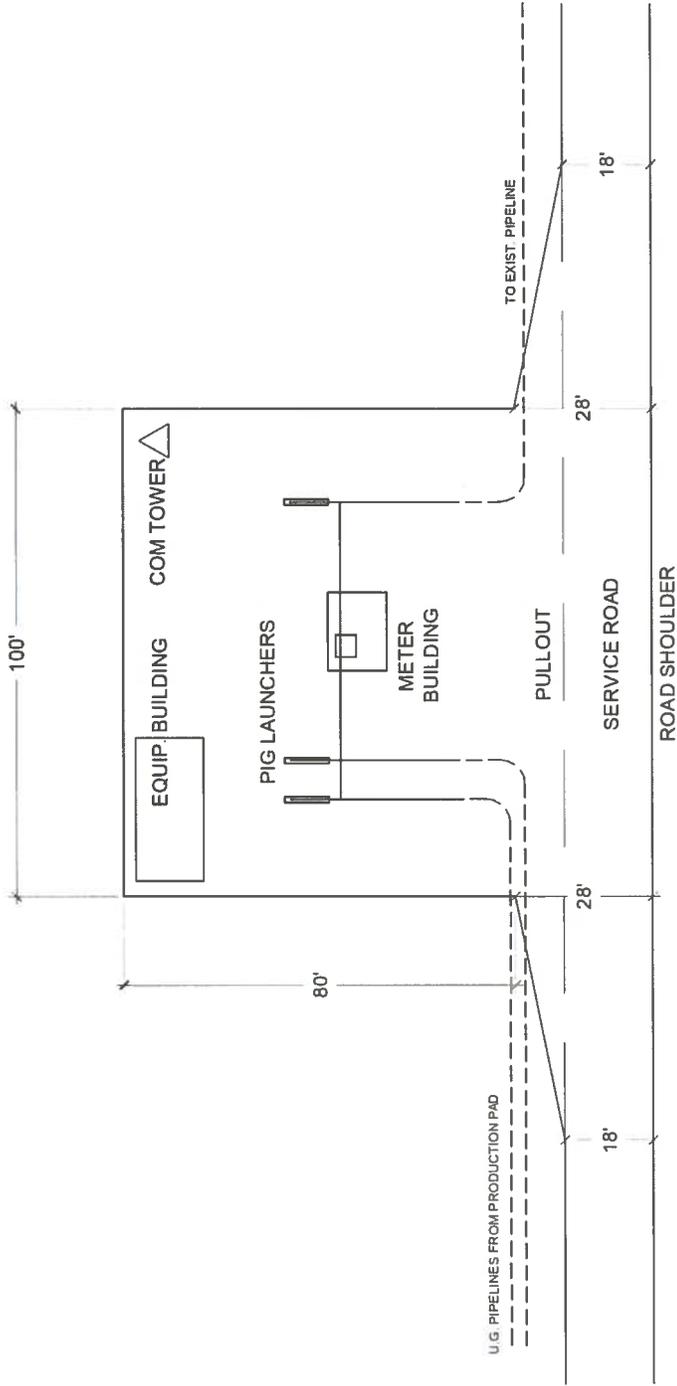
FIGURE: **2**

**DRILLING PAD LAYOUT**  
**SHADURA DEVELOPMENT PROJECT**



Surface Water Flow Direction

Projection State Plane, Alaska Zone 4, NAD83



- NOTES:
1. CONSTRUCT METER FACILITY ON GRAVEL PAD ADJACENT TO SERVICE ROAD PULLOUT.
  2. GRAVEL FILL SIMILAR TO PRODUCTION PAD TYPICAL SECTION.
  3. SECURITY FENCE NOT SHOWN FOR CLARITY.

**A** METER PAD DETAIL  
 SCALE: 1" = 40'

FIGURE:

**3**

**METER PAD SCHEMATIC**

SHADURA DEVELOPMENT PROJECT



NA

SCALE:



Projection State Plane, Alaska Zone 4, NAD83

